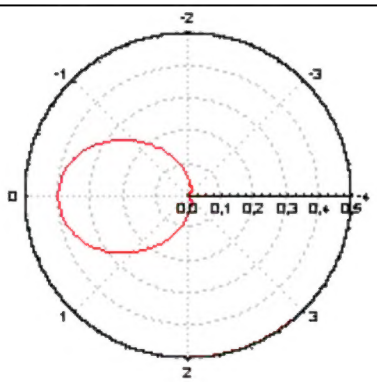
SPSS

BEISPIEL SAMMLUNG



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INHALTSVERZEICHNIS

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BEISPIEL 1; AUFLISTEN VON DATEN:

Rohdaten (bsp01.sav):

Note	Klasse
3,00	1,00
4,00	1,00
4,00	1,00
3,00	1,00
5,00	1,00
1,00	2,00
2,00	2,00
3,00	2,00
2,00	2,00
2,00	2,00

Syntax (bsp01.sps):

```
* Auflisten von Fällen.
list all.
*.
```

Ausgabe:

```
There are 523.664 bytes of memory available.
The largest contiguous area has 522.952 bytes.


280 bytes of memory required for the LIST procedure.
208 bytes have already been acquired.
72 bytes remain to be acquired.

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    NOTE   KLASSE

    3,00     1,00
    4,00     1,00
    4,00     1,00
    3,00     1,00
    5,00     1,00
    1,00     2,00
    2,00     2,00
    3,00     2,00
    2,00     2,00
    2,00     2,00
```

BEISPIEL 2; DESKRIPTIVE KENNWERTE

Rohdaten (bsp01.sav)

Syntax (bsp02.sps):

```
* Deskriptive Kennwerte.
des note.
means tables note by klasse.
* Frequenztabellen.
frequencies note.
* Kontingenztabellen.
crosstabs note by klasse.
*.
```

Ausgabe:

```
76 bytes of memory required for the DESCRIPTIVES procedure.
4 bytes have already been acquired.
72 bytes remain to be acquired.


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Number of valid observations (listwise) =        10,00

                                           Valid
Variable      Mean   Std Dev  Minimum  Maximum    N  Label

NOTE          2,90      1,20     1,00     5,00   10

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Preceding task required ,22 seconds elapsed.


There are 523.872 bytes of memory available.
The largest contiguous area has 523.160 bytes.

Given workspace allows for 13.079 cells of 1 dimensions for MEANS.

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                 - - Description of Subpopulations - -

Summaries of     NOTE
By levels of     KLASSE

Variable       Value  Label                Mean   Std Dev   Cases

For Entire Population                     2,9000   1,1972      10

KLASSE          1,00                      3,8000    ,8367       5
KLASSE          2,00                      2,0000    ,7071       5

  Total Cases = 10

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```

$$AM = \bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$\hat{\sigma} = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})}{n} \cdot \frac{n}{n-1}}$$

```
Preceding task required ,11 seconds elapsed.


There are 523.872 bytes of memory available.
The largest contiguous area has 523.160 bytes.

Memory allows a total of 18.684 values accumulated across all variables.
There may be up to 2.335 value labels for each variable.


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NOTE

                                                          Valid     Cum
Value Label                 Value  Frequency  Percent  Percent  Percent

                             1,00         1     10,0     10,0     10,0
                             2,00         3     30,0     30,0     40,0
                             3,00         3     30,0     30,0     70,0
                             4,00         2     20,0     20,0     90,0
                             5,00         1     10,0     10,0    100,0
                                     -------  -------  -------
                            Total        10    100,0    100,0

Valid cases      10     Missing cases      0

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Preceding task required ,06 seconds elapsed.

There are 523.872 bytes of memory available.
The largest contiguous area has 523.160 bytes.

Memory allows for 11.890 cells with 2 dimensions for general CROSSTABS.

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NOTE  by  KLASSE

                    KLASSE       Page 1 of 1
          Count   |
                  |
                  |                    Row
                  |    1,00|    2,00| Total
NOTE      --------+--------+--------+
            1,00  |        |      1 |     1
                  |        |        |  10,0
                  +--------+--------+
            2,00  |        |      3 |     3
                  |        |        |  30,0
                  +--------+--------+
            3,00  |      2 |      1 |     3
                  |        |        |  30,0
                  +--------+--------+
            4,00  |      2 |        |     2
                  |        |        |  20,0
                  +--------+--------+
            5,00  |      1 |        |     1
                  |        |        |  10,0
                  +--------+--------+
          Column        5        5       10
           Total     50,0     50,0    100,0

Number of Missing Observations:  0
```

BEISPIEL 3; T-TEST FÜR UNABHÄNGIGE STICHPROBEN:

Rohdaten (bsp03.sav)

av	uv
86,00	1,00
80,00	1,00
109,00	1,00
114,00	1,00
89,00	1,00
99,00	1,00
112,00	1,00
115,00	1,00
88,00	1,00
101,00	1,00
98,00	1,00
107,00	1,00
100,00	1,00
88,00	1,00
93,00	1,00
105,00	1,00
125,00	1,00
107,00	1,00
94,00	1,00
102,00	1,00
90,00	1,00
113,00	1,00
109,00	1,00
108,00	1,00
91,00	1,00
108,00	1,00
128,00	1,00
103,00	1,00
92,00	1,00
104,00	1,00
108,00	2,00
125,00	2,00
115,00	2,00
119,00	2,00
101,00	2,00
108,00	2,00
111,00	2,00
98,00	2,00
92,00	2,00
129,00	2,00
104,00	2,00
119,00	2,00
98,00	2,00
104,00	2,00
107,00	2,00
106,00	2,00
108,00	2,00
112,00	2,00
115,00	2,00
104,00	2,00
116,00	2,00
75,00	2,00
110,00	2,00
102,00	2,00
117,00	2,00
101,00	2,00
102,00	2,00
94,00	2,00
107,00	2,00
112,00	2,00

Syntax (bsp03.sps):

```
* t-Test für unabhängige Stichproben
*.
set hig no.
* Deskriptive Statistiken.
fre all
 /format condense
 /histogram
 /statistics mean std sem.
* Test.
t-test groups uv(1 2)
 /var av.
*.
```

Ausgabe:

```
There are 523.872 bytes of memory available.
The largest contiguous area has 523.160 bytes.

Memory allows a total of 18.684 values accumulated across all variables.
There may be up to 2.335 value labels for each variable.


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AV

                    Cum                        Cum                        Cum
  Value   Freq Pct Pct    Value   Freq Pct Pct    Value   Freq Pct Pct

  75,00      1   2   2   100,00      1   2  30   112,00      3   5  78
  80,00      1   2   3   101,00      3   5  35   113,00      1   2  80
  86,00      1   2   5   102,00      3   5  40   114,00      1   2  82
  88,00      2   3   8   103,00      1   2  42   115,00      3   5  87
  89,00      1   2  10   104,00      4   7  48   116,00      1   2  88
  90,00      1   2  12   105,00      1   2  50   117,00      1   2  90
  91,00      1   2  13   106,00      1   2  52   119,00      2   3  93
  92,00      2   3  17   107,00      4   7  58   125,00      2   3  97
  93,00      1   2  18   108,00      5   8  67   128,00      1   2  98
  94,00      2   3  22   109,00      2   3  70   129,00      1   2 100
  98,00      3   5  27   110,00      1   2  72
  99,00      1   2  28   111,00      1   2  73

    Count   Midpoint    One symbol equals approximately  ,40 occurrences

        2         80 |#####
       11         90 |###########################
       16        100 |########################################
       20        110 |##################################################
        7        120 |#################
        4        129 |##########
                     +----+----+----+----+----+----+----+----+----+----+
                     0         4         8        12        16        20
                              Histogram frequency

Mean        104,617     Std err       1,451     Std dev      11,242

Valid cases      60     Missing cases      0
```

$$AM = \bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$\hat{\sigma}_{\bar{x}} = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})}{n \cdot (n-1)}}$$

$$\hat{\sigma} = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})}{n} \cdot \frac{n}{n-1}}$$

```
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UV

                    Cum                     Cum
   Value   Freq Pct Pct    Value   Freq Pct Pct

    1,00     30  50  50     2,00     30  50 100

    Count   Midpoint    One symbol equals approximately   ,60 occurrences

       30          1 |##################################################
       30          2 |##################################################
                     +----+----+----+----+----+----+----+----+----+----+
                     0         6        12        18        24        30
                              Histogram frequency

Mean        1,500     Std err       ,065     Std dev       ,504

Valid cases      60      Missing cases      0

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Preceding task required 1,37 seconds elapsed.


There are 523.864 bytes of memory available.
The largest contiguous area has 262.272 bytes.

T-TEST requires 72 bytes of workspace for execution.

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t-tests for independent samples of  UV

                          Number
      Variable          of Cases    Mean        SD       SE of Mean
    ------------------------------------------------------------------
      AV

      UV 1,                30     101,9333     11,468       2,094
      UV 2,                30     107,3000     10,521       1,921
    ------------------------------------------------------------------

      Mean Difference = -5,3667

      Levene's Test for Equality of Variances: F= ,785   P= ,379

      t-test for Equality of Means                          95%
  Variances  t-value   df    2-Tail Sig    SE of Diff      CI for Diff
  ------------------------------------------------------------------------
  Equal      -1,89     58         ,064        2,841       (-11,056; ,322)
  Unequal    -1,89     57,57      ,064        2,841       (-11,056; ,322)
  ------------------------------------------------------------------------

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Preceding task required ,55 seconds elapsed.
```

n_j

$$\bar{x}_j = \frac{\sum_{i=1}^{n_j} x_{ji}}{n_j}$$

$$\hat{\sigma}_j = \sqrt{\frac{\sum_{i=1}^{n_j}(x_{ji}-\bar{x}_j)}{n_j}\cdot\frac{n_j}{n_j-1}}$$

$$\hat{\sigma}_{\bar{x}_j} = \sqrt{\frac{\sum_{i=1}^{n_j}(x_{ji}-\bar{x}_j)}{n_j\cdot(n_j-1)}}$$

$\bar{x}_1 - \bar{x}_2$

$$t_{emp} = \frac{\bar{x}_1 - \bar{x}_2}{\hat{\sigma}_{(\bar{x}_1-\bar{x}_2)}}$$

$$df_{corr} = \frac{1}{\frac{c^2}{n_1-1} + \frac{(1-c)^2}{n_2-1}}$$

$$CI = (\bar{x}_1 - \bar{x}_2) \pm t_{crit}\cdot\hat{\sigma}_{(\bar{x}_1-\bar{x}_2)}$$

$$\hat{\sigma}_{(\bar{x}_1-\bar{x}_2)} = \sqrt{\frac{(n_1-1)\cdot\hat{\sigma}_1^2 + (n_2-1)\cdot\hat{\sigma}_2^2}{(n_1-1)+(n_2-1)}}\cdot\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}$$

BEISPIEL 4; T-TEST FÜR ABHÄNGIGE STICHPROBEN:

Rohdaten (bsp04.sav , bsp05.sav):

bsp04.sav

av1	av2
71,41	70,24
108,45	105,70
82,41	85,81
69,51	65,55
110,87	110,99
94,02	97,12
125,23	119,30
108,21	107,22
102,80	102,46
110,07	111,07
97,76	100,69
105,30	115,23
102,21	96,04
107,15	106,91
107,24	101,68
83,34	85,42
99,69	81,18
85,08	86,53
102,26	101,01
100,44	105,84
110,95	107,39
111,07	111,43
117,25	120,45
121,36	120,69
121,97	121,49
110,46	111,96
91,30	89,79
103,58	106,77
125,40	124,70
95,32	96,22

bsp05.sav

av12	uv
71,41	1,00
108,45	1,00
82,41	1,00
69,51	1,00
110,87	1,00
94,02	1,00
125,23	1,00
108,21	1,00
102,80	1,00
110,07	1,00
97,76	1,00
105,30	1,00
102,21	1,00
107,15	1,00
107,24	1,00
83,34	1,00
99,69	1,00
85,08	1,00
102,26	1,00
100,44	1,00
110,95	1,00
111,07	1,00
117,25	1,00
121,36	1,00
121,97	1,00
110,46	1,00
91,30	1,00
103,58	1,00
125,40	1,00
95,32	1,00
70,24	2,00
105,70	2,00
85,81	2,00
65,55	2,00
110,99	2,00
97,12	2,00
119,30	2,00
107,22	2,00
102,46	2,00
111,07	2,00
100,69	2,00
115,23	2,00
96,04	2,00
106,91	2,00
101,68	2,00
85,42	2,00
81,18	2,00
86,53	2,00
101,01	2,00
105,84	2,00
107,39	2,00
111,43	2,00
120,45	2,00
120,69	2,00
121,49	2,00
111,96	2,00
89,79	2,00
106,77	2,00
124,70	2,00
96,22	2,00

Syntax (bsp04.sps):

```
* t-Test für abhängige bzw. korrelierte Stichproben
*.
get file="x:\dat\bsp04.sav".
set hig no.
* Histogramme.
fre av1 av2
 /for not
 /his nor.
* Regressionsgraph.
plot
 /plot av1 with av2.
* Test.
T-TEST PAIRS av1 WITH av2.
*
* t-Test für unabhängige Stichproben
*.
get file="x:\dat\bsp05.sav".
* Test.
T-TEST GROUPS uv(1 2) /VARIABLES=av12.
*.
```

Ausgabe:

```
There are 523.880 bytes of memory available.
The largest contiguous area has 523.160 bytes.

Memory allows a total of 18.684 values accumulated across all variables.
There may be up to 2.335 value labels for each variable.


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AV1

    Count   Midpoint    One symbol equals approximately   ,20 occurrences

        2         70 |##:#######
        2         80 |########## .
        3         90 |################              .
        8        100 |########################################.
       10        110 |#####################################:##############
        3        120 |################    .
        2        125 |######:###
                     +----+----+----+----+----+----+----+----+----+----+
                     0         2         4         6         8        10
                               Histogram frequency

Valid cases      30      Missing cases      0

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

AV2

    Count   Midpoint    One symbol equals approximately   ,20 occurrences

        2         70 |###:######
        1         80 |#####       .
        4         90 |####################        .
        7        100 |###################################    .
       10        110 |###################################:################
        6        120 |###################:###########
                     +----+----+----+----+----+----+----+----+----+----+
                     0         2         4         6         8        10
                               Histogram frequency
```

```
Valid cases      30      Missing cases      0
```

```
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* * * * * * * * * * * * * * * * * *  P  L  O  T  * * * * * * * * * * * * * * * * * *

Data   Information

         30 unweighted cases accepted.

Size of the plots

   Horizontal size is 65
     Vertical size is 40
```

```
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```

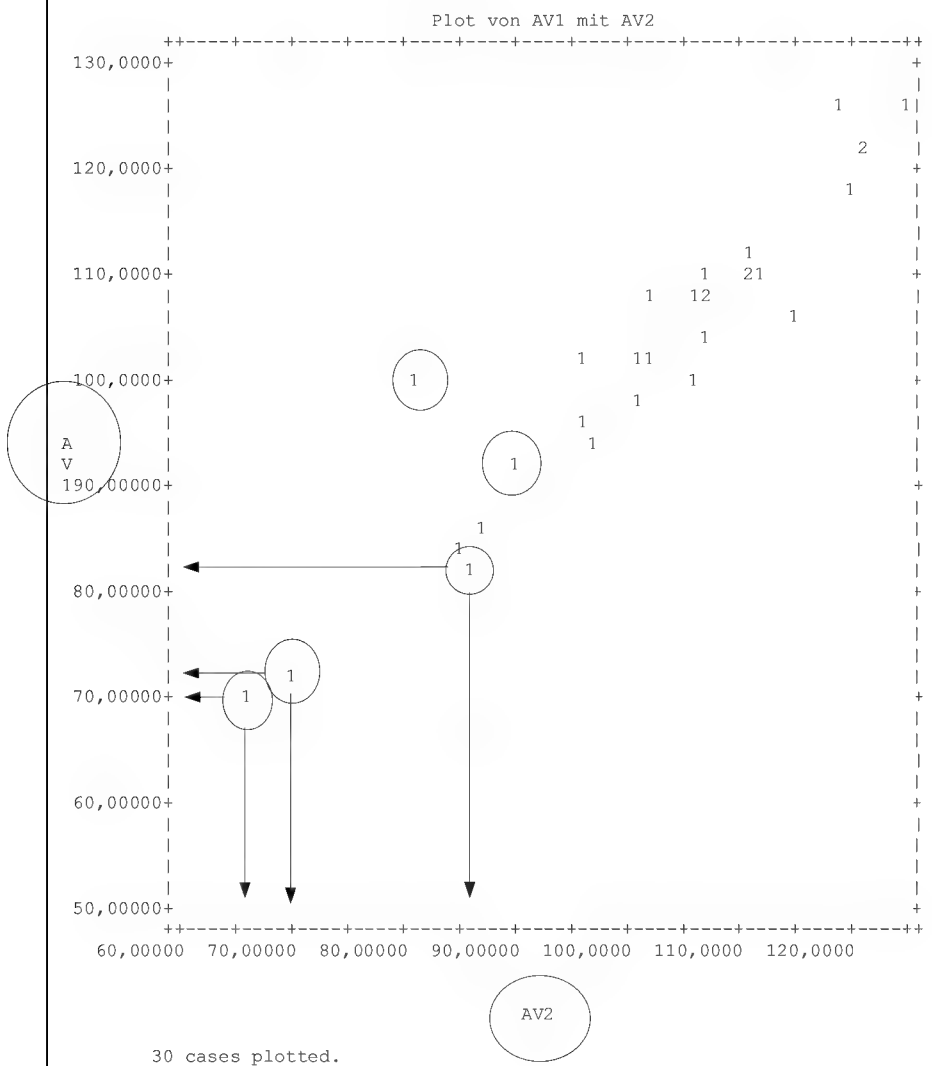


```
       30 cases plotted.
```

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Preceding task required ,11 seconds elapsed.

$$r_{AV1,AV2} = \frac{\sum_{i=1}^{n}(x_{AV1,i} - \bar{x}_{AV1}) \cdot (x_{AV2,i} - \bar{x}_{AV2})}{n \cdot s_{AV1} \cdot s_{AV2}}$$

There are 523.864 bytes of memory available.
The largest contiguous area has 262.128 bytes.

T-TEST requires 64 bytes of workspace for execution.

$\bar{x}_{AV1,AV2}$

n

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$\hat{\sigma}_{AV1,AV2}$

- - - t-tests for paired samples - - -

Variable	Number of pairs	Corr	2-tail Sig	Mean	SD	SE of Mean
AV1	30	,946	,000	102,7370	14,217	2,596
AV2				102,2293	14,777	2,698

$\hat{\sigma}_{\bar{x}_{AV1,AV2}}$

$$\hat{\sigma}_d = \sqrt{\frac{\sum_{i=1}^{n}(d - \bar{x}_d)^2}{n-1}}$$

$$\bar{x}_d = \frac{\sum_{i=1}^{n} d_i}{n}$$

Paired Differences					
Mean	SD	SE of Mean	t-value	df	2-tail Sig
,5077	4,810	,878	,58	29	,568
95% CI (-1,289; 2,304)					

$$CI = \bar{x}_d \pm t_{crit} \cdot \sigma_{\bar{x}_d}$$

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Preceding task required ,06 seconds elapsed.

$$\hat{\sigma}_{\bar{x}_d} = \frac{\hat{\sigma}_d}{\sqrt{n}}$$

$$t_{emp} = \frac{\bar{x}_d}{\hat{\sigma}_{\bar{x}_d}}$$

File c:\dat\bsp_5.sav
Created: 16 Jan 96 14:57:02 - 2 variables and 60 cases

There are 523.864 bytes of memory available.
The largest contiguous area has 262.328 bytes.

T-TEST requires 72 bytes of workspace for execution.

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t-tests for independent samples of UV

Variable	Number of Cases	Mean	SD	SE of Mean
AV12				
UV 1,	30	102,7370	14,217	2,596
UV 2,	30	102,2293	14,777	2,698

Mean Difference = ,5077

Levene's Test for Equality of Variances: F= ,095 P= ,759

Variances	t-value	df	2-Tail Sig	SE of Diff	95% CI for Diff
	t-test for Equality of Means				
Equal	,14	58	,893	3,744	(-6,988; 8,003)
Unequal	,14	57,91	,893	3,744	(-6,988; 8,003)

BEISPIEL 5; MANN-WHITNEY U-TEST

Rohdaten (bsp06.sav):

av	uv
1,00	1,00
2,00	1,00
1,00	1,00
2,00	1,00
2,00	1,00
1,00	1,00
3,00	1,00
10,00	1,00
10,00	1,00
2,00	1,00
4,00	2,00
3,00	2,00
4,00	2,00
4,00	2,00
3,00	2,00
2,00	2,00
4,00	2,00
4,00	2,00
3,00	2,00
4,00	2,00

Syntax (bsp05.sps):

```
* U-Test
*.
get file="c:\dat\bsp06.sav".
set hig no.
* Boxplot.
exa var av by uv
  /plot box.
* U-Test.
npar tests
  /M-W av by uv(1 2).
* Unabhängiger t-test.
t-test gro uv(1 2) /var av.
*.
```

Ausgabe:

```
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     AV

 Valid cases:        20,0   Missing cases:        ,0   Percent missing:      ,0


 Mean        3,4500  Std Err      ,5548  Min         1,0000  Skewness     1,9273
 Median      3,0000  Variance    6,1553  Max        10,0000  S E Skew      ,5121
 5% Trim     3,2222  Std Dev     2,4810  Range       9,0000  Kurtosis     3,7294
 95% CI for Mean (2,2889; 4,6111)        IQR         2,0000  S E Kurt      ,9924


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|

           |
           |     (E note 1)
           |
           |
           |
           |
           |
         8 +
           |
           |
           |
           |
           |
           |
           |
           |
         4 +   +---+
           |   |   |
           |   | * |
           |   |   |
           |   +-+-+
           |     |
           |   --+--
           |
           |
         0 +
           |
           |
           |
```

- $\bar{x}$ → Mean
- Md → Median
- $\bar{x}_{95\%}$ → 5% Trim
- $CI = \bar{x} \pm 2{,}10 \cdot \hat{\sigma}_{\bar{x}}$ → 95% CI for Mean
- $\hat{\sigma}_{\bar{x}}$ → Std Err
- $\hat{\sigma}^2$ → Variance
- $\hat{\sigma}$ → Std Dev
- $x_{max} - x_{min}$ → Range
- $P_{75} - P_{25}$ → IQR
- $\alpha_3 = \frac{\sum_{i=1}^{n} z_i^3}{n}$ → Skewness
- $s_{\alpha 3} = \sqrt{\frac{6}{n}}$ → S E Skew
- $\alpha_4 = \frac{\sum_{i=1}^{n} z_i^4}{n} - 3$ → Kurtosis
- $s_{\alpha 4} = 2 \cdot \sqrt{\frac{6}{n}}$ → S E Kurt
- > 3 IQR → (E note 1)
- Q_3, Md, Q_1, 1,5 IQR → Boxplot

```
          +---------------------------------------------------------------

  Variable     AV

 N of Cases      20,00

      Symbol Key:       *    - Median     (O)  - Outlier    (E)  - Extreme


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 Boxplot footnotes denote the following:

   1)    Case: 8, Case: 9


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     AV
 By  UV          1,00

 Valid cases:        10,0   Missing cases:        ,0   Percent missing:      ,0

 Mean        3,4000  Std Err     1,1175  Min         1,0000  Skewness    1,6442
 Median      2,0000  Variance   12,4889  Max        10,0000  S E Skew     ,6870
 5% Trim     3,1667  Std Dev     3,5340  Range       9,0000  Kurtosis    1,1318
 95% CI for Mean (,8720; 5,9280)         IQR         3,7500  S E Kurt    1,3342


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     AV
 By  UV          2,00

 Valid cases:        10,0   Missing cases:        ,0   Percent missing:      ,0

 Mean        3,5000  Std Err      ,2236  Min         2,0000  Skewness   -1,1785
 Median      4,0000  Variance     ,5000  Max         4,0000  S E Skew     ,6870
 5% Trim     3,5556  Std Dev      ,7071  Range       2,0000  Kurtosis     ,5714
 95% CI for Mean (2,9942; 4,0058)        IQR         1,0000  S E Kurt    1,3342
```

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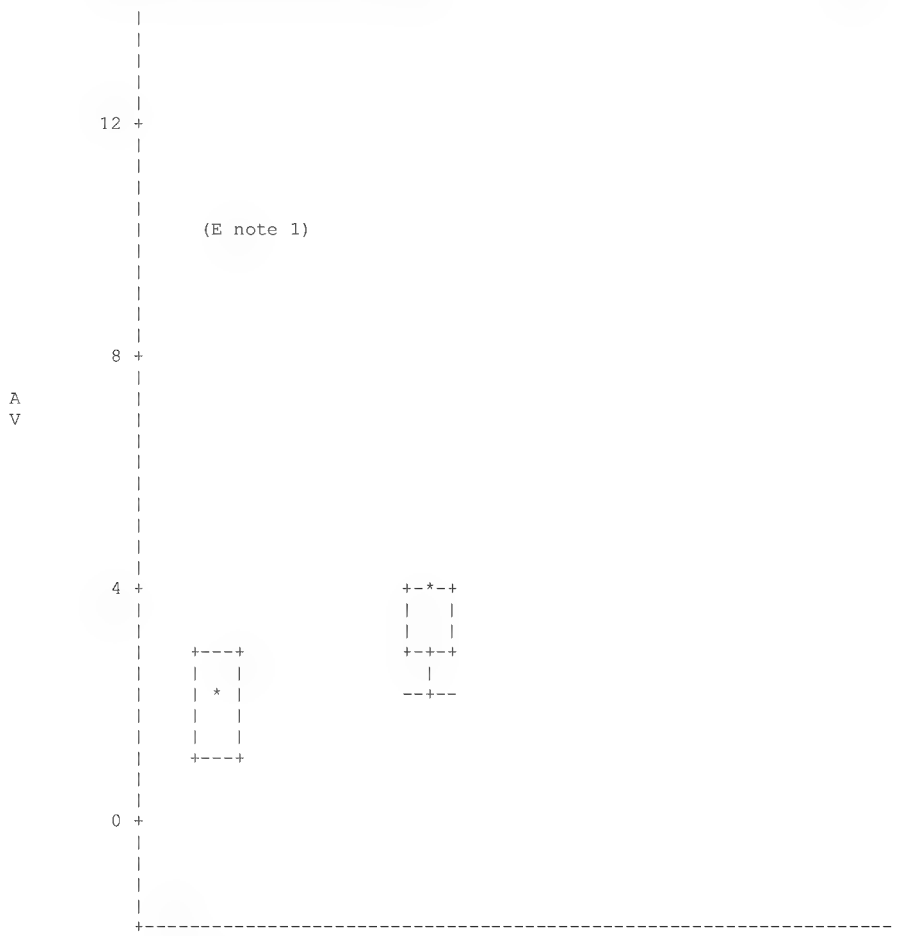

	1,00	2,00
UV		
N of Cases	10,00	10,00

Symbol Key: * - Median (O) - Outlier (E) - Extreme

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Boxplot footnotes denote the following:

1) Case: 8, Case: 9

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Preceding task required ,33 seconds elapsed.

***** Workspace allows for 18724 cases for NPAR tests *****

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\- - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

AV
by UV

$T_j = \sum_{x_n} r x_n$

$R = \frac{T}{n_j}$

Mean Rank	Sum of Ranks	Cases		
7,95	79,50	10	UV	- 1,00
13,05	130,5	10	UV	- 2,00
		20	Total	

$U = n_1 \cdot n_2 + \frac{n_1 \cdot (n_1 + 1)}{2} - T_1$

U	W	Exact** 2*(One-Tailed P)	Z	2-Tailed P
24,5	79,5	,0524	-1,9804	,0477

**This exact p-value is not corrected for ties.

$z = \frac{U - \mu_U}{\sigma_t}$

$p^{\circ}(x) = \frac{\theta > \Theta}{M}$

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Preceding task required ,39 seconds elapsed.

T-TEST requires 72 bytes of workspace for execution.

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t-tests for Independent Samples of UV

Variable	Number of Cases	Mean	SD	SE of Mean
AV				
UV 1	10	3,4000	3,534	1,118
UV 2	10	3,5000	,707	,224

Mean Difference = -,1000

Levene's Test for Equality of Variances: F= 8,590 P= ,009

Variances	t-value	df	2-Tail Sig	SE of Diff	95% CI for Diff
Equal	-,09	18	,931	1,140	(-2,494; 2,294)
Unequal	-,09	9,72	,932	1,140	(-2,649; 2,449)

t-test for Equality of Means

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Preceding task required ,11 seconds elapsed.

BEISPIEL 6; EINFAKTORIELLE VARIANZANALYSE, ONEWAY:

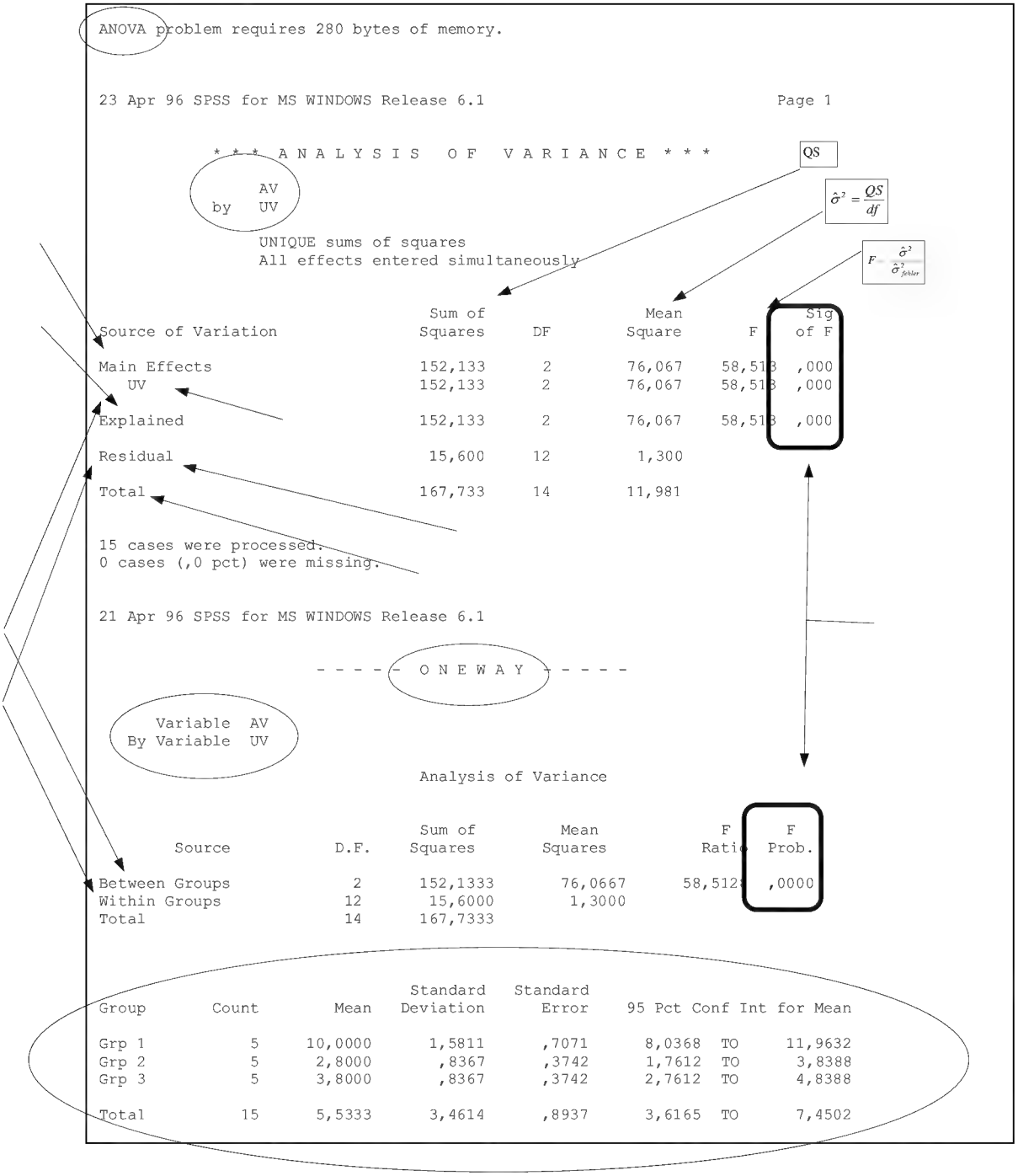
Rohdaten (bsp07.sav):

av	uv
12,00	1,00
10,00	1,00
8,00	1,00
9,00	1,00
11,00	1,00
4,00	2,00
2,00	2,00
3,00	2,00
3,00	2,00
2,00	2,00
4,00	3,00
3,00	3,00
5,00	3,00
4,00	3,00
3,00	3,00

Syntax (bsp06.sps):

```
* Das k-Stichprobenproblem
* (Einfaktorielle Varianzanalyse, Oneway)
*.
get file="x:\dat\bsp07.sav".
* ANOVA.
ano av by uv(1 3).
one av by uv(1 3)
  /ran sch
  /sta des.
* H-Test.
npar tests
  /k-w av by uv(1 3).
* Fehlerbalken.
graph
  /err( ci 95 )=av by uv.
*.
```

Ausgabe:



```
ANOVA problem requires 280 bytes of memory.

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          * * *  A N A L Y S I S   O F   V A R I A N C E  * * *

                AV
          by    UV

                UNIQUE sums of squares
                All effects entered simultaneously

                                  Sum of                Mean          Sig
Source of Variation              Squares     DF        Square       F   of F

Main Effects                     152,133      2        76,067    58,513  ,000
   UV                            152,133      2        76,067    58,513  ,000

Explained                        152,133      2        76,067    58,513  ,000

Residual                          15,600     12         1,300

Total                            167,733     14        11,981

15 cases were processed.
0 cases (,0 pct) were missing.

21 Apr 96 SPSS for MS WINDOWS Release 6.1

                    - - - - -  O N E W A Y  - - - - -

     Variable  AV
  By Variable  UV

                                Analysis of Variance

                                  Sum of        Mean            F      F
        Source           D.F.    Squares      Squares         Ratio  Prob.

Between Groups             2     152,1333      76,0667      58,5128  ,0000
Within Groups             12      15,6000       1,3000
Total                     14     167,7333


                                Standard   Standard
Group       Count        Mean   Deviation     Error    95 Pct Conf Int for Mean

Grp 1           5     10,0000      1,5811      ,7071      8,0368  TO     11,9632
Grp 2           5      2,8000       ,8367      ,3742      1,7612  TO      3,8388
Grp 3           5      3,8000       ,8367      ,3742      2,7612  TO      4,8388

Total          15      5,5333      3,4614      ,8937      3,6165  TO      7,4502
```

QS

$\hat{\sigma}^2 = \frac{QS}{df}$

$F = \frac{\hat{\sigma}^2}{\hat{\sigma}^2_{fehler}}$

```
GROUP          MINIMUM     MAXIMUM

Grp 1           8,0000     12,0000
Grp 2           2,0000      4,0000
Grp 3           3,0000      5,0000

TOTAL           2,0000     12,0000


21 Apr 96 SPSS for MS WINDOWS Release 6.1                          Page 2

                    - - - - -  O N E W A Y  - - - - -


     Variable  AV
  By Variable  UV

Multiple Range Tests: Scheffe test with significance level ,05

The difference between two means is significant if
  MEAN(J)-MEAN(I)  >= ,8062 * RANGE * SQRT(1/N(I) + 1/N(J))
  with the following value(s) for RANGE: 3,94

 (*) Indicates significant differences which are shown in the lower triangle

                    G G G
                    r r r
                    p p p

                    2 3 1
    Mean    UV

   2,8000   Grp 2
   3,8000   Grp 3
  10,0000   Grp 1    * *

 Homogeneous Subsets (highest and lowest means are not significantly different)

Subset 1

Group       Grp 2         Grp 3

Mean        2,8000        3,8000
- - - - - - - - - - - - - -

Subset 2

Group       Grp 1

Mean       10,0000
- - - - - -


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Preceding task required ,05 seconds elapsed.
```

```
***** Workspace allows for 18724 cases for NPAR tests *****


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- - - - - Kruskal-Wallis 1-Way Anova

   AV
by UV

     Mean Rank     Cases

         13,00         5   UV -     1
          4,00         5   UV -     2
          7,00         5   UV -     3

                      --

                      15   Total

  Chi-Square        D.F.   Significance
    10,7890            2          ,0045
```
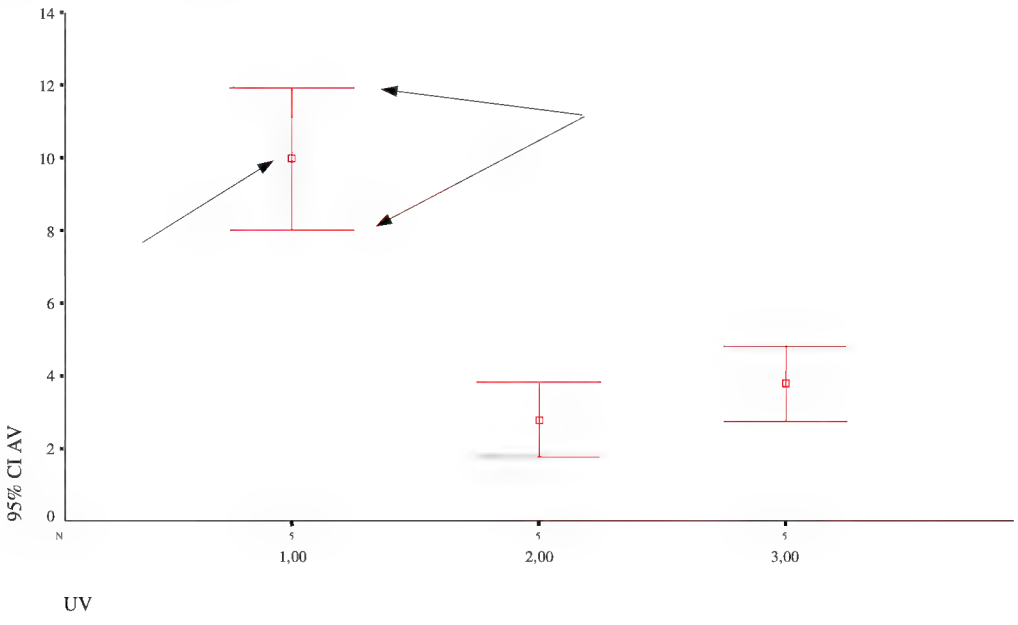

Hi-Res Chart # 9:Fehlerbalken von av nach uv



BEISPIEL 7; KORRELATIONEN

Rohdaten (bsp09.sav):

AV1	AV2	AV3	AV4	AV5	AV6
70,24	87,44	121,01	92,11	96,14	85,44
105,70	103,10	113,83	106,54	95,56	95,51
85,81	78,96	109,31	102,33	76,92	100,96
65,55	97,64	85,00	90,64	96,94	111,20
110,99	105,80	113,58	109,94	124,07	118,94
97,12	99,64	98,89	90,73	82,02	102,20
119,30	79,53	69,36	112,90	120,29	82,78
107,22	98,10	118,32	122,20	82,45	100,77
102,46	96,27	110,43	99,36	81,76	89,77
111,07	108,02	137,97	110,72	91,33	103,01
100,69	84,88	119,23	112,78	111,29	86,73
115,23	111,64	141,52	103,78	87,43	106,26
96,04	104,08	129,87	114,31	121,31	93,49
106,91	104,11	108,87	89,37	81,21	136,29
101,68	97,99	121,49	88,92	98,80	103,35
85,42	101,48	103,80	110,77	114,89	98,67
81,18	116,89	54,74	107,78	94,97	118,71
86,53	93,64	94,76	83,04	102,79	111,19
101,01	117,93	95,81	128,05	107,66	138,74
105,84	86,75	100,05	93,98	84,70	89,41
107,39	115,16	84,69	133,72	108,94	102,65
111,43	97,70	87,76	103,21	100,96	145,01
120,45	109,61	109,46	109,50	98,99	106,05
120,69	94,63	120,56	115,80	79,52	81,56
121,49	114,26	106,92	110,55	124,12	130,78
111,96	106,86	83,37	105,03	96,37	130,90
89,79	112,03	81,79	106,99	117,00	121,14
106,77	75,52	135,10	99,23	120,12	116,74
124,70	106,41	89,17	115,24	122,22	96,03
96,22	87,48	101,05	102,44	77,05	114,62
81,79	107,86	86,00	108,91	75,65	109,54

Syntax (bsp07.sps) :

```
*Korrelation
*.
get file="c:\dat\bsp09.sav".
*Produkt-Moment Korrelation r.
cor all
 /pri nos.
*Matrix Scatterplot.
graph /scat(mat)=av1 av2 av3 av4 av5 av6.
cor av1 av2 with all
 /av3 with av6
 /pri nos.
cor av3 with av6
 /pri sig.
*Bivariater Scatterplot.
graph /scat(biv)=av3 with av6.
*Spearman-Korrelation.
nonpar corr all
  / pri nos bot.
*Multiple Korrelation R.
reg
 /var av1 av2 av3
 /dep av1
```

```
 /met ent.
*3D Scatterplot.
graph /scat(xyz)=av2 with av1 with av3.
*.
```

Ausgabe:

```
PEARSON CORR problem requires 816 bytes of workspace.


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                    - -  Correlation Coefficients  - -

              AV1        AV2        AV3        AV4        AV5        AV6

AV1         1,0000      ,1353      ,2190      ,3850*     ,2109      ,0361
AV2          ,1353     1,0000     -,2092      ,3978*     ,1358      ,4397*
AV3          ,2190     -,2092     1,0000     -,0822     -,0849     -,2628
AV4          ,3850*     ,3978*    -,0822     1,0000      ,3078     -,0418
AV5          ,2109      ,1358     -,0849      ,3078     1,0000      ,1070
AV6          ,0361      ,4397*    -,2628     -,0418      ,1070     1,0000

* - Signif. LE ,05     ** - Signif. LE ,01     (2-tailed)

" , " is printed if a coefficient cannot be computed


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Preceding task required ,49 seconds elapsed.
```
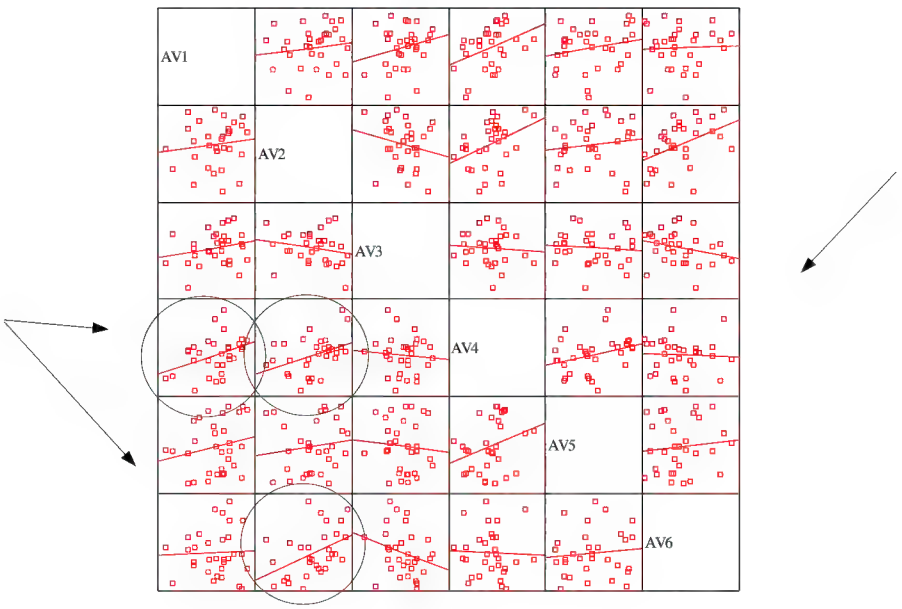

```
Hi-Res Chart  # 1:Matrix von av1 av2 av3 av4 av5 av6
```



```
PEARSON CORR problem requires 784 bytes of workspace.


07 May 96 SPSS for MS WINDOWS Release 6.1                              Page 3

                    - -  Correlation Coefficients  - -

             AV1         AV2         AV3         AV4         AV5         AV6

AV1         1,0000**     ,1353       ,2190       ,3850*      ,2109       ,0361
AV2          ,1353      1,0000**    -,2092       ,3978*      ,1358       ,4397*

* - Signif. LE ,05      ** - Signif. LE ,01      (2-tailed)

" , " is printed if a coefficient cannot be computed


07 May 96 SPSS for MS WINDOWS Release 6.1                              Page 4

                    - -  Correlation Coefficients  - -

             AV6

AV3         -,2628

* - Signif. LE ,05      ** - Signif. LE ,01      (2-tailed)

" , " is printed if a coefficient cannot be computed


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Preceding task required ,06 seconds elapsed.


PEARSON CORR problem requires 80 bytes of workspace.


07 May 96 SPSS for MS WINDOWS Release 6.1                              Page 6

                    - -  Correlation Coefficients  - -

             AV6

AV3         -,2628
            (   31)
            P- ,153

(Coefficient / (Cases) / 2-tailed Significance)

" , " is printed if a coefficient cannot be computed
```
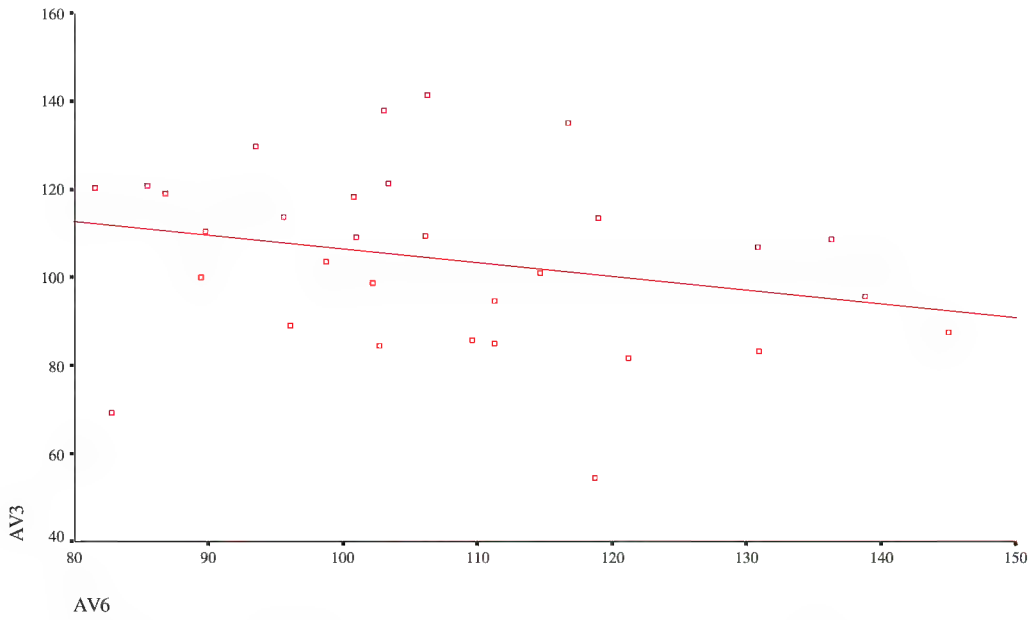

Hi-Res Chart # 2:Scatterplot von av6 av3



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Preceding task required ,00 seconds elapsed.

*** Workspace allows for 14563 cases for nonparametric correlation problem ***

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- - - - K E N D A L L C O R R E L A T I O N C O E F F I C I E N T S - - -

	AV1	AV2	AV3	AV4	AV5
AV2	,1355				
AV3	,1097	-,1699			
AV4	,2645*	,2602*	-,0237		
AV5	,1613	,1312	-,0581	,2172	
AV6	,0194	,3247*	-,2258	-,1398	,0839

* - Signif. LE ,05 ** - Signif. LE ,01 (2-tailed)

" , " is printed if a coefficient cannot be computed

```
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- - - S P E A R M A N  C O R R E L A T I O N  C O E F F I C I E N T S - - -

AV2             ,1923
AV3             ,1476     -,2359
AV4             ,3839*     ,4004*    -,0391
AV5             ,2355      ,1802     -,0980      ,3468
AV6             ,0137     ,4843**    -,3270     -,2052      ,1210

                  AV1        AV2        AV3        AV4        AV5

* - Signif. LE ,05     ** - Signif. LE ,01     (2-tailed)

" , " is printed if a coefficient cannot be computed


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Preceding task required ,38 seconds elapsed.

1404 bytes of memory required for REGRESSION procedure.
        0 more bytes may be needed for Residuals plots.



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          * * * *  M U L T I P L E  R E G R E S S I O N  * * * *

Listwise Deletion of Missing Data

Equation Number 1    Dependent Variable..   AV1

Block Number  1.  Method:  Enter

Variable(s) Entered on Step Number
   1..     AV3
   2..     AV2

Multiple R           ,28678
R Square             ,08224
Adjusted R Square    ,01669
Standard Error     14,85962

Analysis of Variance
                    DF       Sum of Squares       Mean Square
Regression           2           554,02309         277,01154
Residual            28          6182,63391         220,80835

F =       1,25453       Signif F =  ,3008
```

$$R_{y.12} = \sqrt{\frac{r_{y1}^2 + r_{y2}^2 - 2r_{y1}r_{y2}r_{12}}{1-r_{12}^2}}$$

$$F = \frac{R^2 \cdot (n-k-1)}{(1-R^2) \cdot k}$$

$z=b_1x+b_2y+a = z=0{,}246x + 0{,}193y+56{,}827$

$$t = \frac{b_i}{\sqrt{\frac{r^{ii}(1-R^2)}{n-k-1}}}$$

$$a = x_c - (b_1'x_1 + b_2'x_2)$$

```
------------------ Variables in the Equation ------------------

Variable            B         SE B        Beta           T  Sig T

AV2              ,246131     ,240655     ,189355     1,023  ,3152
AV3              ,192863     ,138079     ,258598     1,397  ,1735
(Constant)     56,827459   30,648906                 1,854  ,0743

End Block Number   1   All requested variables entered.


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Preceding task required 1,76 seconds elapsed.
```
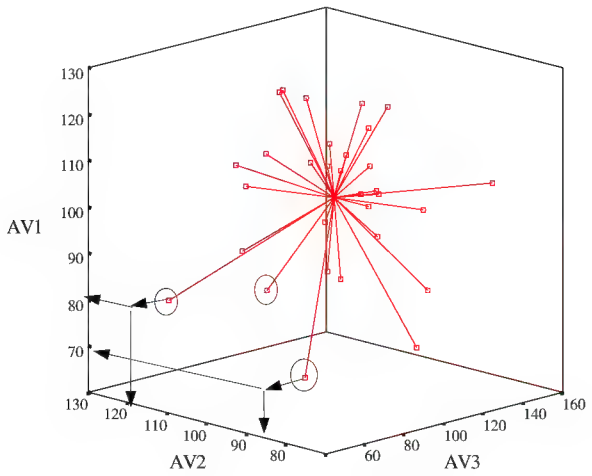

Hi-Res Chart # 3:3d-scatterplot von av2 av1 av3



BEISPIEL 8; SCOREBERECHNUNG:

Rohdaten (bsp10.sav):

Sex	Age	item1	item2	item3	item4
1	31	2	1	6	1
1	29	4	1	5	1
2	28	3	2	5	2
2	35	5	3	3	3
2	27	6	2	2	5

Syntax (bsp08.sps):

```
* Berechnen von Scores, Umkodieren
* von Variablen
*.
compute score1=sum(item1 to item4).
exe.
compute score2=item1*item2-(item3+item4).
exe.
recode sex (1 eq 0) (2 eq 1).
exe.
if age le 30 age_d eq 1.
if age gt 30 age_d eq 2.
exe.
*.
```

Ausgabe :

Sex	Age	item1	item2	item3	item4	score1	score2	age_d
0	31	2	1	6	1	**10,00**	**-5,00**	**2,00**
0	29	4	1	5	1	**11,00**	**-2,00**	**1,00**
1	28	3	2	5	2	**12,00**	**-1,00**	**1,00**
1	35	5	3	3	3	**14,00**	**9,00**	**2,00**
1	27	6	2	2	5	**15,00**	**5,00**	**1,00**

BEISPIEL 9; ASCII DATEN EINLESEN:

Syntax (bsp09.sps) :

```
* Direktes Einlesen von Rohdaten mit festem Format.
data list tab /it1 1 it2 2 gr 3.
begin data.
681
451
761
```

```
641
851
462
542
342
562
792
end data.
des all.

* Direktes Einlesen von Rohdaten mit freiem Format.
data list lis /it1 it2 gr.
begin data.
6 8 1
  4  5 1
7 6   1
    6   4 1
8  5 1
4 6    2
  5  4  2
3   4 2
5 6      2
7               9 2
end data.
exe.
list all.
for it1 (f1.0) it2 (f6.4) gr (f5.1).
list all.
for it1 (n1) it2 (n1) gr (n1).
list all.
wri out='x:\dat\n_daten.dat' /all.
exe.
*.
```

Ausgabe :

it1	it2	gr
6	8	1
4	5	1
7	6	1
6	4	1
8	5	1
4	6	2
5	4	2
3	4	2
5	6	2
7	9	2

```
                                                  Valid
Variable      Mean    Std Dev   Minimum   Maximum      N  Label

IT1           5,50       1,58         3         8     10
IT2           5,70       1,70         4         9     10
GR            1,50        ,53         1         2     10


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```

it1	it2	gr
6,00	8,00	1,00
4,00	5,00	1,00
7,00	6,00	1,00
6,00	4,00	1,00
8,00	5,00	1,00
4,00	6,00	2,00
5,00	4,00	2,00
3,00	4,00	2,00
5,00	6,00	2,00
7,00	9,00	2,00

```
     IT1       IT2       GR

    6,00      8,00     1,00
    4,00      5,00     1,00
    7,00      6,00     1,00
    6,00      4,00     1,00
    8,00      5,00     1,00
    4,00      6,00     2,00
    5,00      4,00     2,00
    3,00      4,00     2,00
    5,00      6,00     2,00
    7,00      9,00     2,00


Number of cases read:  10    Number of cases listed:  10
```

it1	it2	gr
6	8,0000	1,0
4	5,0000	1,0
7	6,0000	1,0
6	4,0000	1,0
8	5,0000	1,0
4	6,0000	2,0
5	4,0000	2,0
3	4,0000	2,0
5	6,0000	2,0
7	9,0000	2,0

```
IT1    IT2    GR

 6  8,0000   1,0
 4  5,0000   1,0
 7  6,0000   1,0
 6  4,0000   1,0
 8  5,0000   1,0
 4  6,0000   2,0
```

```
5  4,0000   2,0
3  4,0000   2,0
5  6,0000   2,0
7  9,0000   2,0

Number of cases read:  10    Number of cases listed:  10
```

it1	it2	gr
6	**8**	**1**
4	**5**	**1**
7	**6**	**1**
6	**4**	**1**
8	**5**	**1**
4	**6**	**2**
5	**4**	**2**
3	**4**	**2**
5	**6**	**2**
7	**9**	**2**


```
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IT1 IT2 GR

 6   8   1
 4   5   1
 7   6   1
 6   4   1
 8   5   1
 4   6   2
 5   4   2
 3   4   2
 5   6   2
 7   9   2

Number of cases read:  10    Number of cases listed:  10
```
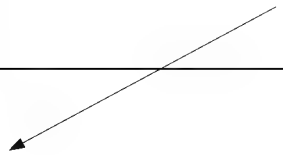

BEISPIEL 10; Z-WERTE, VARIABLEN UND DATENBEZEICHNUNG, AUSSCHREIBEN VON ASCII DATEN:

Rohdaten (bsp11.dat):



```
681
451
761
641
851
462
542
342
562
792
```

Syntax (bsp10.sps):

```
* Einlesen einer ASCII-Rohdatendatei mit fesem Format.
set hig no.
data list file='x:\dat\bsp11.dat' /it1 1 it2 2 gr 3 .
exe.
* z-Werte Berechnung.
des it1(z1) it2(z2).
list all.
* Beschreibung von Variablen und Faellen.
var lab it1 'Gedaechtnisleistung' it2 'Reaktionszeit'
 /gr 'Versuchsbedingung' z1 'z-Wert der Gedaechtnisleistung'
 /z2 'z-Wert der Reaktionszeit'.
val lab gr 1 'Vormittag' 2 'Nachmittag'.
exe.
* Berechnung verschiedener Scores.
compute leist=it1+it2.
var lab leist 'Leistungsniveau'.
if leist le 11 lei_d eq 1.
if leist gt 11 lei_d eq 2.
var lab lei_d 'Leistungsniveau dichotom'.
val lab lei_d 1 'niedrig' 2 'hoch'.
exe.
* Statistiken der Scores.
fre all /sta mean /his.
cro gr by lei_d
 /cel cou exp tot
 /sta chi phi.
cor gr with lei_d.
npar tests /m-w leist by gr(1 2).
* Speichern der berechneten Scores in ASCII Format.
wri out="x:\dat\n_daten.dat"
 /gr z1 z2 leist lei_d.
exe.
wri out='x:\dat\n_daten.dat'
 /all.
exe.
* Speichern der berechneten Scores in Binär Format.
save out="x:\dat\bsp11.sav"
 /com.
exe.
*.
```

Ausgabe :

```
Number of valid observations (listwise) =       10,00

                                                  Valid
Variable      Mean     Std Dev   Minimum   Maximum      N  Label

IT1           5,50        1,58         3         8     10
IT2           5,70        1,70         4         9     10
```

```
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The following Z-Score variables have been saved on your working file:

From        To                                                    Weighted
Variable    Z-Score    Label                                       Valid N
--------    -------    -----                                       -------

IT1         Z1         Zscore(IT1)                                      10
IT2         Z2         Zscore(IT2)                                      10


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IT1  IT2  GR          Z1          Z2

 6    8    1       ,31623     1,35061
 4    5    1      -,94868     -,41105
 7    6    1       ,94868      ,17617
 6    4    1       ,31623     -,99827
 8    5    1      1,58114     -,41105
 4    6    2      -,94868      ,17617
 5    4    2      -,31623     -,99827
 3    4    2     -1,58114     -,99827
 5    6    2      -,31623      ,17617
 7    9    2       ,94868     1,93783

Number of cases read:  10    Number of cases listed:  10


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```
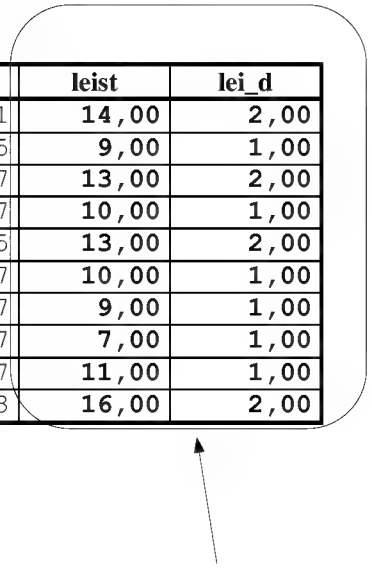

it1	it2	gr		z1	z2
6	8	1		,31623	1,35061
4	5	1		-,94868	-,41105
7	6	1		,94868	,17617
6	4	1		,31623	-,99827
8	5	1		1,58114	-,41105
4	6	2		-,94868	,17617
5	4	2		-,31623	-,99827
3	4	2		-1,58114	-,99827
5	6	2		-,31623	,17617
7	9	2		,94868	1,93783

it1	it2	gr	z1	z2	leist	lei_d
6	8	1	,31623	1,35061	**14,00**	**2,00**
4	5	1	-,94868	-,41105	**9,00**	**1,00**
7	6	1	,94868	,17617	**13,00**	**2,00**
6	4	1	,31623	-,99827	**10,00**	**1,00**
8	5	1	1,58114	-,41105	**13,00**	**2,00**
4	6	2	-,94868	,17617	**10,00**	**1,00**
5	4	2	-,31623	-,99827	**9,00**	**1,00**
3	4	2	-1,58114	-,99827	**7,00**	**1,00**
5	6	2	-,31623	,17617	**11,00**	**1,00**
7	9	2	,94868	1,93783	**16,00**	**2,00**



```
IT1      Gedaechtnisleistung

                                                        Valid     Cum
Value Label                 Value  Frequency  Percent  Percent  Percent

                                3         1     10,0     10,0     10,0
                                4         2     20,0     20,0     30,0
                                5         2     20,0     20,0     50,0
                                6         2     20,0     20,0     70,0
                                7         2     20,0     20,0     90,0
                                8         1     10,0     10,0    100,0
                                     -------  -------  -------
                            Total        10    100,0    100,0


    Count   Midpoint    One symbol equals approximately   ,10 occurrences

        1          3 |##########
        2          4 |####################
        2          5 |####################
        2          6 |####################
        2          7 |####################
        1          8 |##########
                     +----+----+----+----+----+----+----+----+----+----+
                     0         1         2         3         4         5
                              Histogram frequency

Mean          5,500

Valid cases      10      Missing cases      0


- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
IT2      Reaktionszeit

                                                        Valid     Cum
Value Label                 Value  Frequency  Percent  Percent  Percent

                                4         3     30,0     30,0     30,0
                                5         2     20,0     20,0     50,0
                                6         3     30,0     30,0     80,0
                                8         1     10,0     10,0     90,0
                                9         1     10,0     10,0    100,0
                                     -------  -------  -------
                            Total        10    100,0    100,0


    Count   Midpoint    One symbol equals approximately   ,10 occurrences

        3          4 |##############################
        2          5 |####################
        3          6 |##############################
        0          7 |
        1          8 |##########
        1          9 |##########
                     +----+----+----+----+----+----+----+----+----+----+
                     0         1         2         3         4         5
                              Histogram frequency

Mean          5,700


Valid cases      10      Missing cases      0


- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

GR Versuchsbedingung

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Vormittag	1	5	50,0	50,0	50,0
Nachmittag	2	5	50,0	50,0	100,0
	Total	10	100,0	100,0	

```
    Count   Midpoint    One symbol equals approximately   ,10 occurrences

        5          1 |##################################################
        5          2 |##################################################
                     +----+----+----+----+----+----+----+----+----+----+
                     0         1         2         3         4         5
                               Histogram frequency
```

Mean 1,500

Valid cases 10 Missing cases 0

- -

Z1 z-Wert der Gedaechtnisleistung

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	-1,58114	1	10,0	10,0	10,0
	-,94868	2	20,0	20,0	30,0
	-,31623	2	20,0	20,0	50,0
	,31623	2	20,0	20,0	70,0
	,94868	2	20,0	20,0	90,0
	1,58114	1	10,0	10,0	100,0
	Total	10	100,0	100,0	

```
    Count   Midpoint    One symbol equals approximately   ,10 occurrences

        3         -1 |##############################
        4          0 |########################################
        2          1 |####################
        1          2 |##########
                     +----+----+----+----+----+----+----+----+----+----+
                     0         1         2         3         4         5
                               Histogram frequency
```

Mean ,000

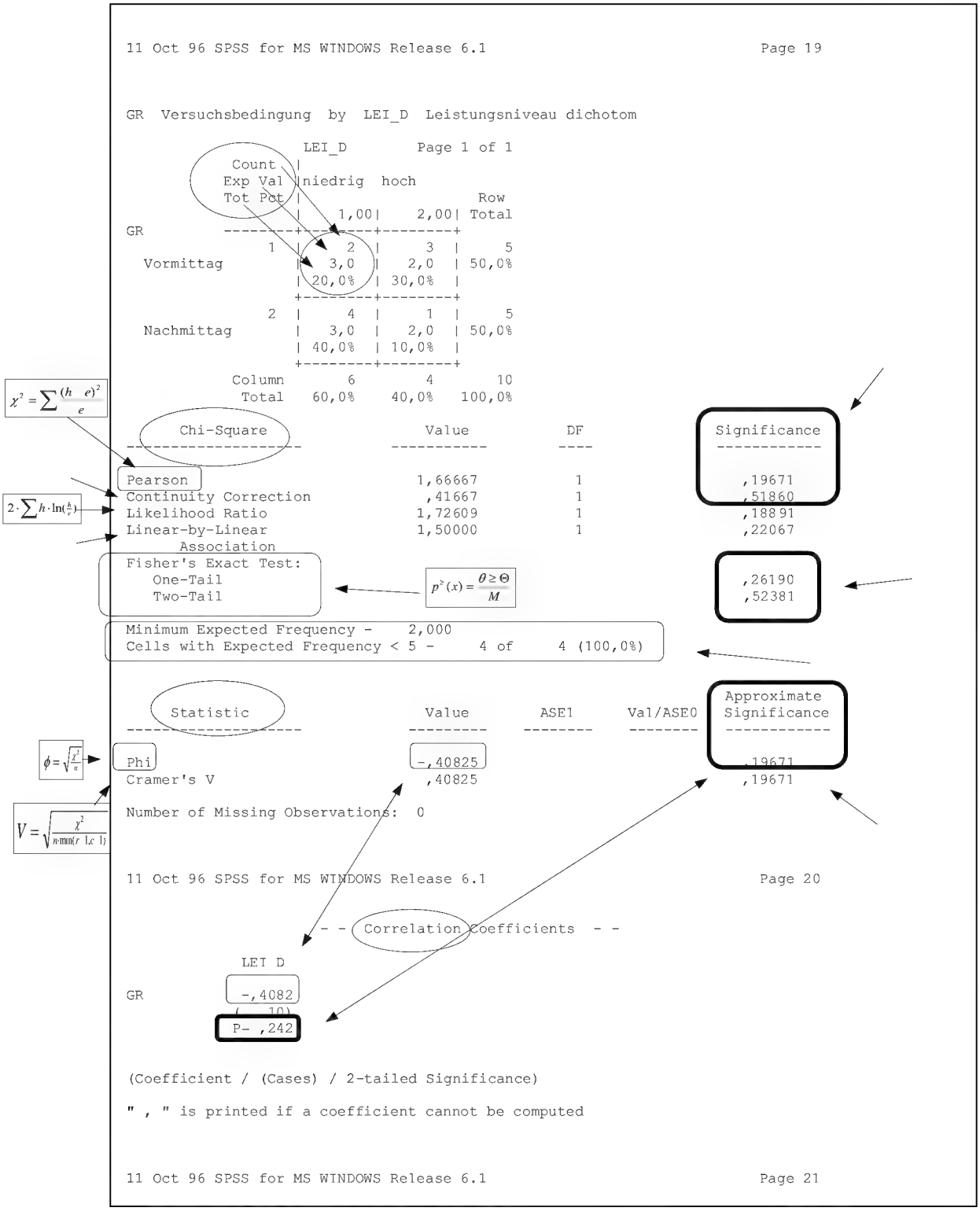
Valid cases 10 Missing cases 0

- -

Z2 z-Wert der Reaktionszeit

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	-,99827	3	30,0	30,0	30,0
	-,41105	2	20,0	20,0	50,0
	,17617	3	30,0	30,0	80,0
	1,35061	1	10,0	10,0	90,0
	1,93783	1	10,0	10,0	100,0
	Total	10	100,0	100,0	

```
Count   Midpoint    One symbol equals approximately   ,20 occurrences

        8          0 |########################################
        1          1 |#####
        1          2 |#####
                     +----+----+----+----+----+----+----+----+----+----+
                     0         2         4         6         8        10
                               Histogram frequency

Mean           ,000


Valid cases      10      Missing cases      0


- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

LEIST     Leistungsniveau


                                                          Valid     Cum
Value Label                 Value  Frequency  Percent  Percent  Percent

                             7,00         1     10,0     10,0     10,0
                             9,00         2     20,0     20,0     30,0
                            10,00         2     20,0     20,0     50,0
                            11,00         1     10,0     10,0     60,0
                            13,00         2     20,0     20,0     80,0
                            14,00         1     10,0     10,0     90,0
                            16,00         1     10,0     10,0    100,0
                                    -------  -------  -------
                            Total        10    100,0    100,0


    Count   Midpoint    One symbol equals approximately   ,10 occurrences

        1          8 |##########
        4         10 |########################################
        1         12 |##########
        3         14 |##############################
        1         16 |##########
                     +----+----+----+----+----+----+----+----+----+----+
                     0         1         2         3         4         5
                               Histogram frequency

Mean         11,200


Valid cases      10      Missing cases      0


- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

LEI D     Leistungsniveau dichotom


                                                          Valid     Cum
Value Label                 Value  Frequency  Percent  Percent  Percent

niedrig                      1,00         6     60,0     60,0     60,0
hoch                         2,00         4     40,0     40,0    100,0
                                    -------  -------  -------
                            Total        10    100,0    100,0


    Count   Midpoint    One symbol equals approximately   ,20 occurrences

        6          1 |##############################
        4          2 |####################
                     +----+----+----+----+----+----+----+----+----+----+
                     0         2         4         6         8        10
                               Histogram frequency

Mean          1,400


Valid cases      10      Missing cases      0
```



```
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GR  Versuchsbedingung  by  LEI_D  Leistungsniveau dichotom

                    LEI_D        Page 1 of 1
           Count  |
          Exp Val |niedrig  hoch
          Tot Pct |                    Row
                  |    1,00|    2,00| Total
GR        --------+--------+--------+
               1  |      2 |      3 |     5
  Vormittag       |    3,0 |    2,0 | 50,0%
                  | 20,0%  | 30,0%  |
                  +--------+--------+
               2  |      4 |      1 |     5
  Nachmittag      |    3,0 |    2,0 | 50,0%
                  | 40,0%  | 10,0%  |
                  +--------+--------+
           Column       6        4       10
            Total   60,0%    40,0%   100,0%

     Chi-Square                  Value          DF          Significance
-------------------           -----------      ----         ------------

Pearson                          1,66667          1             ,19671
Continuity Correction             ,41667          1             ,51860
Likelihood Ratio                 1,72609          1             ,18891
Linear-by-Linear                 1,50000          1             ,22067
      Association
Fisher's Exact Test:
   One-Tail                                                    ,26190
   Two-Tail                                                    ,52381

Minimum Expected Frequency -     2,000
Cells with Expected Frequency < 5 -      4 of      4 (100,0%)


     Statistic                   Value       ASE1      Val/ASE0   Approximate
-------------------           ---------    --------    --------   Significance
                                                                  ------------
Phi                             -,40825                            ,19671
Cramer's V                       ,40825                            ,19671

Number of Missing Observations:  0


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                    - - Correlation Coefficients  - -

              LEI D
GR            -,4082
              (  10)
              P- ,242


(Coefficient / (Cases) / 2-tailed Significance)

" , " is printed if a coefficient cannot be computed


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```

$\chi^2 = \sum \frac{(h \quad e)^2}{e}$

$2 \cdot \sum h \cdot \ln(\frac{h}{e})$

$p^{\geq}(x) = \frac{\theta \geq \Theta}{M}$

$\phi = \sqrt{\frac{\chi^2}{n}}$

$V = \sqrt{\frac{\chi^2}{n \cdot \min(r \quad 1, c \quad 1)}}$

```
- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

    LEIST     Leistungsniveau
  by GR       Versuchsbedingung

    Mean Rank    Sum of Ranks  Cases
         6,20          31,00      5  GR       =  1   Vormittag
         4,80          24,00      5  GR       =  2   Nachmittag
                                 --
                                 10  Total

                                Exact**
          U            W   2*(One-Tailed P)       Z      2-Tailed P
          9,0         24,0       ,5476          -,7379       ,4606

**This exact p-value is not corrected for ties.


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```

1	,31623	1,35061	14,00	2,00
1	-,94868	-,41105	9,00	1,00
1	,94868	,17617	13,00	2,00
1	,31623	-,99827	10,00	1,00
1	1,58114	-,41105	13,00	2,00
2	-,94868	,17617	10,00	1,00
2	-,31623	-,99827	9,00	1,00
2	-1,58114	-,99827	7,00	1,00
2	-,31623	,17617	11,00	1,00
2	,94868	1,93783	16,00	2,00

681	,31623	1,35061	14,00	2,00
451	-,94868	-,41105	9,00	1,00
761	,94868	,17617	13,00	2,00
641	,31623	-,99827	10,00	1,00
851	1,58114	-,41105	13,00	2,00
462	-,94868	,17617	10,00	1,00
542	-,31623	-,99827	9,00	1,00
342	-1,58114	-,99827	7,00	1,00
562	-,31623	,17617	11,00	1,00
792	,94868	1,93783	16,00	2,00

BEISPIEL 11; DATENMANIPULATION:

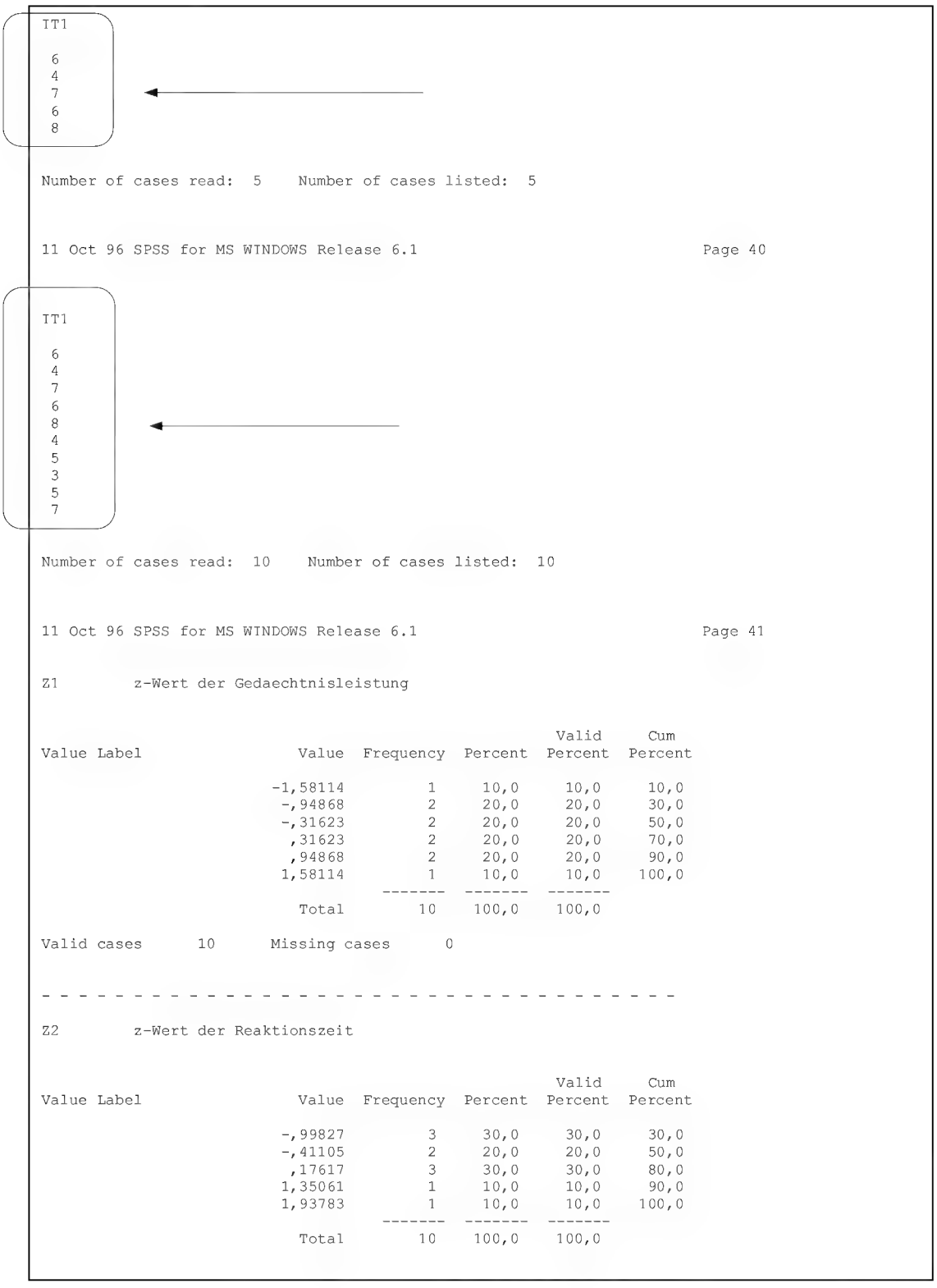
Rohdaten (bsp11.sav):

it1	it2	gr	z1	z2	leist	lei_d
6	8	1	,31623	1,35061	14,00	2,00
4	5	1	-,94868	-,41105	9,00	1,00
7	6	1	,94868	,17617	13,00	2,00
6	4	1	,31623	-,99827	10,00	1,00
8	5	1	1,58114	-,41105	13,00	2,00
4	6	2	-,94868	,17617	10,00	1,00
5	4	2	-,31623	-,99827	9,00	1,00
3	4	2	-1,58114	-,99827	7,00	1,00
5	6	2	-,31623	,17617	11,00	1,00
7	9	2	,94868	1,93783	16,00	2,00

Syntax (bsp11.sps):

```
* Bedingte Auswertung, Manipulation der Rohdaten
*.
get file="x:\dat\bsp11.sav".
* Bedingte Auswertung.
temporary.
sel if gr eq 1.
list it1.
list it1.
tem.
sel if z1 lt 2 and z1 gt -2 or z2 lt 2 and z2 gt -2.
fre z1 z2.
* Beschränkte Fallanzahl.
tem.
n of cas 3.
list all.
* Aufteilung der Rohdatenmatrix.
split file by gr.
fre leist.
split file off.
list all.
sor cas by lei_d.
split file by lei_d.
fre gr.
split file off.
sor cas by gr.
list all.
* Transponierung.
flip all.
list all.
*.
```

Ausgabe:



```
IT1

 6
 4
 7
 6
 8

Number of cases read:  5    Number of cases listed:  5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IT1

 6
 4
 7
 6
 8
 4
 5
 3
 5
 7

Number of cases read:  10    Number of cases listed:  10


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Z1        z-Wert der Gedaechtnisleistung


                                                      Valid      Cum
Value Label                Value  Frequency  Percent  Percent   Percent

                        -1,58114          1     10,0     10,0      10,0
                         -,94868          2     20,0     20,0      30,0
                         -,31623          2     20,0     20,0      50,0
                          ,31623          2     20,0     20,0      70,0
                          ,94868          2     20,0     20,0      90,0
                        1,58114           1     10,0     10,0     100,0
                                       -------  -------  -------
                          Total           10    100,0    100,0

Valid cases      10      Missing cases      0


- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Z2        z-Wert der Reaktionszeit


                                                      Valid      Cum
Value Label                Value  Frequency  Percent  Percent   Percent

                         -,99827          3     30,0     30,0      30,0
                         -,41105          2     20,0     20,0      50,0
                          ,17617          3     30,0     30,0      80,0
                        1,35061           1     10,0     10,0      90,0
                        1,93783           1     10,0     10,0     100,0
                                       -------  -------  -------
                          Total           10    100,0    100,0
```

```
Valid cases      10      Missing cases      0


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IT1 IT2 GR          Z1          Z2    LEIST    LEI_D

 6   8   1      ,31623     1,35061    14,00     2,00
 4   5   1     -,94868     -,41105     9,00     1,00
 7   6   1      ,94868      ,17617    13,00     2,00

Number of cases read:  3    Number of cases listed:  3


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GR:  1   Vormittag
LETST     Leistungsniveau

                                                    Valid     Cum
Value Label                Value  Frequency  Percent  Percent  Percent

                            9,00          1     20,0     20,0     20,0
                           10,00          1     20,0     20,0     40,0
                           13,00          2     40,0     40,0     80,0
                           14,00          1     20,0     20,0    100,0
                                    -------  -------  -------
                           Total          5    100,0    100,0

Valid cases       5      Missing cases      0


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GR:  2   Nachmittag
LETST     Leistungsniveau

                                                    Valid     Cum
Value Label                Value  Frequency  Percent  Percent  Percent

                            7,00          1     20,0     20,0     20,0
                            9,00          1     20,0     20,0     40,0
                           10,00          1     20,0     20,0     60,0
                           11,00          1     20,0     20,0     80,0
                           16,00          1     20,0     20,0    100,0
                                    -------  -------  -------
                           Total          5    100,0    100,0

Valid cases       5      Missing cases      0
```

```
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IT1 IT2 GR          Z1          Z2    LEIST    LEI_D

 6   8   1      ,31623     1,35061    14,00     2,00
 4   5   1     -,94868     -,41105     9,00     1,00
 7   6   1      ,94868      ,17617    13,00     2,00
 6   4   1      ,31623     -,99827    10,00     1,00
 8   5   1     1,58114     -,41105    13,00     2,00
 4   6   2     -,94868      ,17617    10,00     1,00
 5   4   2     -,31623     -,99827     9,00     1,00
 3   4   2    -1,58114     -,99827     7,00     1,00
 5   6   2     -,31623      ,17617    11,00     1,00
 7   9   2      ,94868     1,93783    16,00     2,00


Number of cases read:  10    Number of cases listed:  10
```

it1	it2	gr	z1	z2	leist	lei_d
4	5	1	-,94868	-,41105	9,00	**1,00**
6	4	1	,31623	-,99827	10,00	**1,00**
4	6	2	-,94868	,17617	10,00	**1,00**
5	4	2	-,31623	-,99827	9,00	**1,00**
3	4	2	-1,58114	-,99827	7,00	**1,00**
5	6	2	-,31623	,17617	11,00	**1,00**
6	8	1	,31623	1,35061	14,00	**2,00**
7	6	1	,94868	,17617	13,00	**2,00**
8	5	1	1,58114	-,41105	13,00	**2,00**
7	9	2	,94868	1,93783	16,00	**2,00**

```
LEI_D:      1,00   niedrig

GR        Versuchsbedingung


                                                    Valid      Cum
Value Label                Value  Frequency  Percent  Percent  Percent

Vormittag                      1          2     33,3     33,3     33,3
Nachmittag                     2          4     66,7     66,7    100,0
                                --------  -------  -------
                           Total          6    100,0    100,0

Valid cases       6      Missing cases      0



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LEI_D:      2,00   hoch

GR        Versuchsbedingung


                                                    Valid      Cum
Value Label                Value  Frequency  Percent  Percent  Percent

Vormittag                      1          3     75,0     75,0     75,0
Nachmittag                     2          1     25,0     25,0    100,0
                                --------  -------  -------
                           Total          4    100,0    100,0

Valid cases       4      Missing cases      0
```

it1	it2	gr	z1	z2	leist	lei_d
4	5	1	-,94868	-,41105	9,00	1,00
6	4	1	,31623	-,99827	10,00	1,00
6	8	1	,31623	1,35061	14,00	2,00
7	6	1	,94868	,17617	13,00	2,00
8	5	1	1,58114	-,41105	13,00	2,00
4	6	2	-,94868	,17617	10,00	1,00
5	4	2	-,31623	-,99827	9,00	1,00
3	4	2	-1,58114	-,99827	7,00	1,00
5	6	2	-,31623	,17617	11,00	1,00
7	9	2	,94868	1,93783	16,00	2,00

```
IT1 IT2 GR          Z1          Z2    LEIST    LEI D

 4   5   1     -,94868     -,41105     9,00     1,00
 6   4   1      ,31623     -,99827    10,00     1,00
 6   8   1      ,31623    1,35061    14,00     2,00
 7   6   1      ,94868     ,17617    13,00     2,00
 8   5   1     1,58114     -,41105    13,00     2,00
 4   6   2     -,94868     ,17617    10,00     1,00
 5   4   2     -,31623     -,99827     9,00     1,00
 3   4   2    -1,58114     -,99827     7,00     1,00
 5   6   2     -,31623     ,17617    11,00     1,00
 7   9   2      ,94868    1,93783    16,00     2,00


Number of cases read:  10    Number of cases listed:  10
```

case_lbl	var001	var002	var003	var004	var005	var006	var007	var008	var009	var010
IT1	4,00	6,00	6,00	7,00	8,00	4,00	5,00	3,00	5,00	7,00
IT2	5,00	4,00	8,00	6,00	5,00	6,00	4,00	4,00	6,00	9,00
GR	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00
Z1	-,95	,32	,32	,95	1,58	-,95	-,32	-1,58	-,32	,95
Z2	-,41	-1,00	1,35	,18	-,41	,18	-1,00	-1,00	,18	1,94
LEIST	9,00	10,00	14,00	13,00	13,00	10,00	9,00	7,00	11,00	16,00
LEI_D	1,00	1,00	2,00	2,00	2,00	1,00	1,00	1,00	1,00	2,00

```
The variables are listed in the following order:

LINE   1: CASE_LBL VAR001 VAR002 VAR003 VAR004 VAR005 VAR006

LINE   2: VAR007 VAR008 VAR009 VAR010

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CASE_LBL: TT1          4,00     6,00     6,00     7,00     8,00     4,00
  VAR007:     5 ,00     3,00     5,00     7,00

CASE LBL: TT2          5,00     4,00     8,00     6,00     5,00     6,00
  VAR007:     4,00     4,00     6,00     9,00

CASE LBL: GR           1,00     1,00     1,00     1,00     1,00     2,00
  VAR007:     2,00     2,00     2,00     2,00

CASE LBL: Z1           -,95      ,32      ,32      ,95     1,58     -,95
  VAR007:     -,32    -1,58     -,32      ,95

CASE LBL: Z2           -,41    -1,00     1,35      ,18     -,41      ,18
  VAR007:    -1,00    -1,00      ,18     1,94

CASE LBL: LETST        9,00    10,00    14,00    13,00    13,00    10,00
  VAR007:     9,00     7,00    11,00    16,00

CASE_LBL: LEI_D        1,00     1,00     2,00     2,00     2,00     1,00
  VAR007:     1,00     1,00     1,00     2,00


Number of cases read:  7    Number of cases listed:  7


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```

BEISPIEL 12; ERZEUGUNG VON ZUFALLSZAHLEN, MAKRODEFINITION:

Syntax (bsp12.sps):

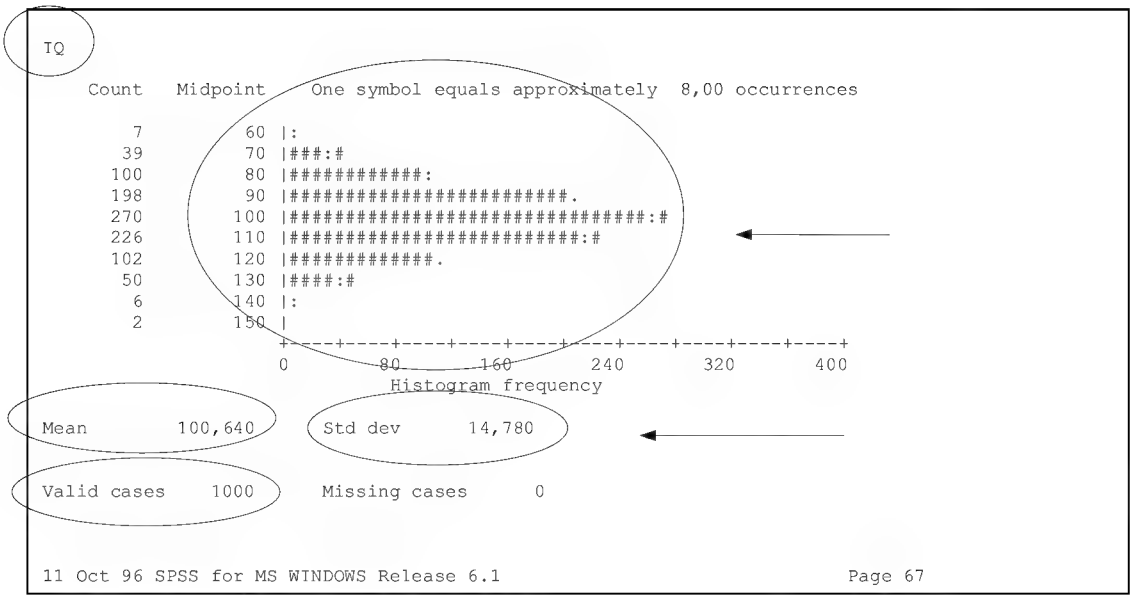
```
* Datengenerierung
*.
* Generiereung  normalverteilter
* Pseude-Zufallszahlen.
set hig no
 /seed 23435.
new file.
data list fre / iq .
begin data
0
end data.
loop #=1 to 1000.
+ compute iq = (normal(15)+100).
write out="dmy.dat" /iq.
end loop.
exe.
data list file="dmy.dat" fre /iq.
exe.
fre iq /for not / sta mea std /his nor.
*
* Generierung 2er normalverteilter
* unabhängiger Variablen mit
* Lageunterschied.
set seed ran.
new file.
data list fre / iq gr.
begin data.
0 1
end data.
loop #=1 to 1000.
+ do if # le 500.
+  compute iq = (normal(15)+100).
+  compute gr = 1.
+ else.
+  compute iq = (normal(12)+110).
+  compute gr = 2.
+ end if.
write out="dmy.dat" /iq gr.
end loop.
exe.
data list file="dmy.dat" fre /iq gr.
exe.
* Makrodefinition.
define !makro(!pos !tok (1)).
split file by gr.
fre var=!1/for not/ sta mea std /his nor.
split file off.
t-test gro=gr /var!1.
```

```
!enddefine.
!makro iq.
des iq(ziq_1).
!makro ziq_1.
split file by gr.
des iq(ziq_2).
split file off.
!makro ziq_2.
*.
```

Ausgabe:

```
  90,20
 100,19
  95,69
 100,21
  80,68
 104,55
 123,49
 108,12
  91,75
 101,75
  98,06
    :
    :
  74,07
  97,52
 122,55
  81,93
 110,40
  84,06
  95,43
  97,53
 118,29
  80,07
```

iq
90,20
100,19
95,69
100,21
80,68
104,55
123,49
108,12
91,75
101,75
98,06
:
:
74,07
97,52
122,55
81,93
110,40
84,06
95,43
97,53
118,29
80,07



```
TQ

    Count   Midpoint    One symbol equals approximately  8,00 occurrences

        7         60 |:
       39         70 |###:#
      100         80 |############:
      198         90 |#########################.
      270        100 |#################################:#
      226        110 |##########################:#
      102        120 |#############.
       50        130 |####:#
        6        140 |:
        2        150 |
                     +----+----+----+----+----+----+----+----+----+----+
                     0        80       160       240       320       400
                                Histogram frequency

Mean        100,640     Std dev      14,780

Valid cases    1000     Missing cases      0

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```

```
   94,01    1,00
   86,30    1,00
   91,08    1,00
   94,83    1,00
   85,16    1,00
  114,74    1,00
  105,72    1,00
   96,64    1,00
  100,90    1,00
  129,35    1,00
     :        :
     :        :
  113,26    2,00
  122,07    2,00
  124,54    2,00
  108,56    2,00
  101,83    2,00
  106,04    2,00
  127,66    2,00
  107,04    2,00
  118,37    2,00
  101,56    2,00
```

iq	gr
94,01	1,00
86,30	1,00
91,08	1,00
94,83	1,00
85,16	1,00
114,74	1,00
105,72	1,00
96,64	1,00
100,90	1,00
129,35	1,00
:	:
:	:
113,26	2,00
122,07	2,00
124,54	2,00
108,56	2,00
101,83	2,00
106,04	2,00
127,66	2,00
107,04	2,00
118,37	2,00
101,56	2,00

```
GR:      1,00

IQ

    Count   Midpoint    One symbol equals approximately  4,00 occurrences

        2         50 |#
        7         60 |:#
       18         70 |#####.
       66         80 |################:#
      116         90 |##############################:#
      127        100 |################################:
       91        110 |######################## .
       52        120 |###########:#
       19        130 |###:#
        2        139 |:
                     +----+----+----+----+----+----+----+----+----+----+
                     0        40        80       120       160       200
                              Histogram frequency

Mean          98,540      Std dev      15,098

Valid cases     500      Missing cases      0


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GR:      2,00

IQ

    Count   Midpoint    One symbol equals approximately  4,00 occurrences

        1         70 |
        5         80 |:
       34         90 |########:
      116        100 |##############################:
      186        110 |############################################:####
      113        120 |############################ .
       37        130 |#########.
        8        140 |#:
                     +----+----+----+----+----+----+----+----+----+----+
                     0        40        80       120       160       200
                              Histogram frequency
```

```
Mean        110,296      Std dev      11,337

Valid cases     500      Missing cases      0

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t-tests for Independent Samples of GR

                              Number
 Variable                    of Cases       Mean          SD   SE of Mean
 ---------------------------------------------------------------------
 IQ

 GR 1                          500       98,5400      15,098         ,675
 GR 2                          500      110,2963      11,337         ,507
 ---------------------------------------------------------------------

          Mean Difference = -11,7563

          Levene's Test for Equality of Variances: F= 40,435 P= ,000

       t-test for Equality of Means                                   95%
 Variances   t-value       df    2-Tail Sig     SE of Diff          CI for Diff
 ---------------------------------------------------------------------------
 Equal        -13,92      998          ,000           ,844    (-13,413; -10,099)
 Unequal      -13,92   925,97          ,000           ,844    (-13,413; -10,099)
 ---------------------------------------------------------------------------


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Number of valid observations (listwise) =      1000,00

                                                     Valid
Variable       Mean    Std Dev   Minimum   Maximum      N  Label

IQ           104,42      14,58     49,85    142,66   1000

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The following Z-Score variables have been saved on your working file:

From        To                                                 Weighted
Variable    Z-Score    Label                                    Valid N
--------    -------    -----                                    -------

IQ          ZIQ 1      Zscore(IQ)                                 1000

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```

iq	gr	ziq_1
94,01	1,00	-,71375
86,30	1,00	-1,24246
91,08	1,00	-,91467
94,83	1,00	-,65751
85,16	1,00	-1,32064
114,74	1,00	,70783
105,72	1,00	,08928
96,64	1,00	-,53339
100,90	1,00	-,24126
129,35	1,00	1,70972
:	:	:
:	:	:
113,26	2,00	,60634
122,07	2,00	1,21049
124,54	2,00	1,37987
108,56	2,00	,28403
101,83	2,00	-,17748
106,04	2,00	,11122
127,66	2,00	1,59383
107,04	2,00	,17980
118,37	2,00	,95676
101,56	2,00	-,19600


```
GR:       1,00

ZIQ 1     Zscore(IQ)

    Count   Midpoint    One symbol equals approximately  2,00 occurrences

        9         -3 |#:###
        8         -3 |#### .
       23         -2 |############  .
       62         -2 |##############################:###
       92         -1 |##############################################:#####
       87         -1 |##############################################   .
       79          0 |########################################   .
       69          1 |##################################:##
       39          1 |###################:#
       28          2 |########:#####
        2          2 |# .
        2          2 |:
                     +----+----+----+----+----+----+----+----+----+----+
                     0        20        40        60        80       100
                              Histogram frequency

Mean          -,403      Std dev       1,035

Valid cases     500      Missing cases      0
```

```
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GR:       2,00

ZIQ_1     Zscore(IQ)

    Count   Midpoint    One symbol equals approximately  4,00 occurrences

        1         -2 |
        6         -2 |#:
       23         -1 |######.
       70         -1 |################:##
      113          0 |###########################:
      132          1 |###############################:##
       90          1 |########################.
       39          2 |########## .
       20          2 |###:#
        6          3 |:#
                     +----+----+----+----+----+----+----+----+----+----+
                     0        40        80       120       160       200
                              Histogram frequency

Mean            ,403     Std dev        ,777

Valid cases      500     Missing cases      0


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t-tests for Independent Samples of GR

                              Number
Variable                     of Cases       Mean          SD   SE of Mean
-----------------------------------------------------------------------------
ZIQ_1  Zscore(IQ)
GR 1                          500        -,4031       1,035         ,046
GR 2                          500         ,4031        ,777         ,035
-----------------------------------------------------------------------------

          Mean Difference = -,8062

          Levene's Test for Equality of Variances: F= 40,435 P= ,000

      t-test for Equality of Means                                    95%
Variances   t-value       df    2-Tail Sig     SE of Diff           CI for Diff
-----------------------------------------------------------------------------
Equal        -13,92      998          ,000          ,058        (-,920; -,693)
Unequal      -13,92   925,97          ,000          ,058        (-,920; -,693)
-----------------------------------------------------------------------------


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```

iq	gr	ziq_1	ziq_2
94,01	1,00	-,71375	**-,30004**
86,30	1,00	-1,24246	**-,81070**
91,08	1,00	-,91467	**-,49411**
94,83	1,00	-,65751	**-,24573**
85,16	1,00	-1,32064	**-,88621**
114,74	1,00	,70783	**1,07299**
105,72	1,00	,08928	**,47556**
96,64	1,00	-,53339	**-,12584**
100,90	1,00	-,24126	**,15631**
129,35	1,00	1,70972	**2,04067**
:	:	:	:
:	:	:	:
113,26	2,00	,60634	**,26142**
122,07	2,00	1,21049	**1,03852**
124,54	2,00	1,37987	**1,25639**
108,56	2,00	,28403	**-,15315**
101,83	2,00	-,17748	**-,74678**
106,04	2,00	,11122	**-,37543**
127,66	2,00	1,59383	**1,53160**
107,04	2,00	,17980	**-,28722**
118,37	2,00	,95676	**,71216**
101,56	2,00	-,19600	**-,77060**

```
GR:      1,00

ZIQ_2     Zscore(IQ)

    Count   Midpoint    One symbol equals approximately  2,00 occurrences

        9         -3 |#:###
       10         -2 |##### .
       25         -2 |#############  .
       66         -1 |#############################:###
       98         -1 |###############################################:#####
       99          0 |##################################################:#
       68          1 |##################################         .
       69          1 |#############################:#####
       34          2 |###############:#
       19          2 |######:###
        3          3 |#:
                     +----+----+----+----+----+----+----+----+----+----+
                     0        20        40        60        80       100
                              Histogram frequency

Mean           ,000      Std dev       1,000

Valid cases     500      Missing cases      0


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```

```
GR:      2,00

ZIQ 2     Zscore(IQ)

    Count   Midpoint    One symbol equals approximately  4,00 occurrences

        1         -4 |
        1         -3 |
        4         -3 |:
       13         -2 |##:
       31         -2 |#######:
       65         -1 |###############:#
       80         -1 |#################### .
      115          0 |########################:####
       75          1 |###################  .
       65          1 |###############:#
       26          2 |#######.
       17          2 |##:#
        4          3 |:
        3          3 |#
                     +----+----+----+----+----+----+----+----+----+----+
                     0        40        80       120       160       200
                              Histogram frequency

Mean           ,000      Std dev       1,000

Valid cases     500      Missing cases      0


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t-tests for Independent Samples of GR


                            Number
 Variable                  of Cases       Mean          SD   SE of Mean
 ---------------------------------------------------------------------
 ZIQ_2  Zscore(IQ)

 GR 1                         500         ,0000       1,000         ,045
 GR 2                         500         ,0000       1,000         ,045
 ---------------------------------------------------------------------

          Mean Difference = ,0000

          Levene's Test for Equality of Variances: F= ,228   P= ,633

       t-test for Equality of Means                                  95%
 Variances   t-value       df    2-Tail Sig     SE of Diff          CI for Diff
 ---------------------------------------------------------------------------
 Equal           ,00      998         1,000          ,063         (-,124; ,124)
 Unequal         ,00   998,00         1,000          ,063         (-,124; ,124)
 ---------------------------------------------------------------------------


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```

BEISPIEL 13; VERSCHIEDENES:

Syntax (bsp13.sps):

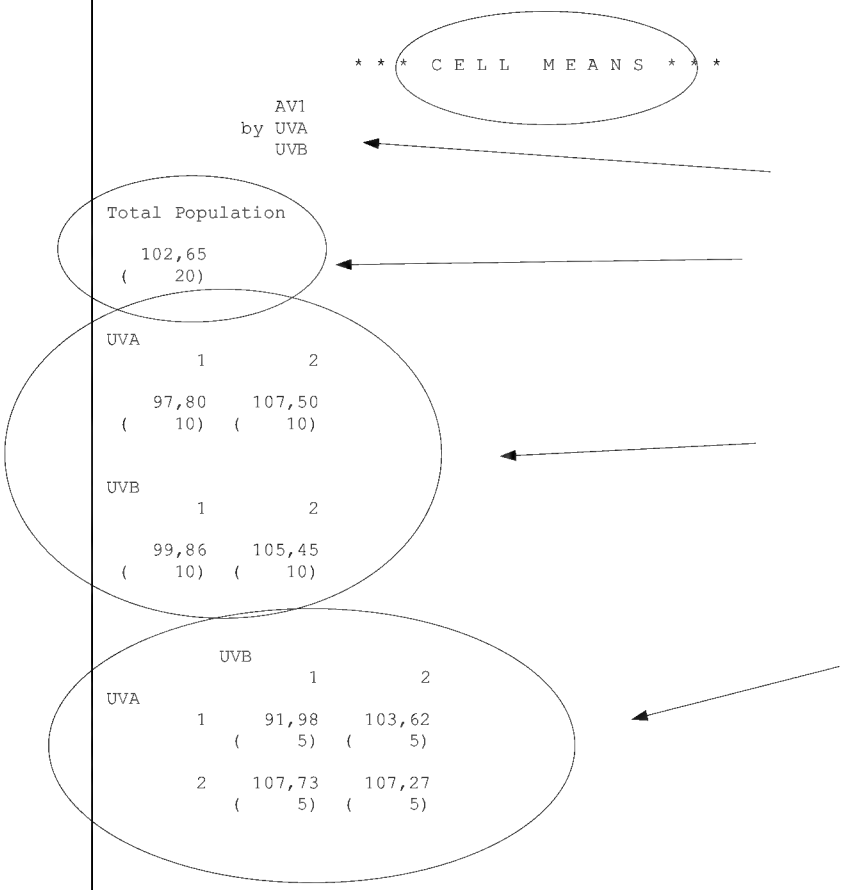
```
* ANOVA, MANOVA, Partielle Korrelation
*
* Makro Struktur
*.
define makdef(!pos !enc ('>','<') /!pos !enc ('>','<')
              /!pos !enc ('>','<') /!pos !enc ('>','<')
              /!pos !enc ('>','<') /!pos !enc ('>','<')
              /!pos !enc ('>','<') /!pos !enc ('>','<')
              ).
set !1.
comp r=1.
comp t=-1.
comp lauf=!2/4.
exe.
* UV-Code Generierung
* 2 x 2 orthogonal.
loop j=1 to 4.
+ comp r=r*t.
- loop k=1 to lauf.
-  comp y=r.
-  comp z=t.
-  write out=!6 /y z.
- end loop.
+ comp t=t*-1.
end loop.
exe.
data lis file=!6 fre /uva uvb.
recod uva (-1 eq 1) (1 eq 2)
 /uvb (-1 eq 1) (1 eq 2).
for uva(n1) uvb(n1).
exe.
sav out=!7 /com.
exe.
* AV-Generierung.
loop i=1 to !2.
!3.
!4.
!5.
write out=!8 /x y z.
break.
end loop.
exe.
data list file=!8 fre /av1 av2 av3.
exe.
match fil /file=*/file=!7.
exe.
!enddefine.
*.
```

```
data list fre /x y z r t.
begin data.
0 0 0 0 0
end data.
* Makroaufruf.
makdef >seed 1234<
       >20<
       >comp x=(normal(10))+100<
       >comp y = x + 8 + (normal(10))<
       >comp z = x + 4 + (normal(10))<
       >iv.dat< >iv.sav<
       >"demy.dat"<.
* Unabhängige Messungen:
* ANOVA mehrfaktoriell .
ano av1 by uva(1 2) uvb(1 2)
  /sta mca mea
  /met hie.
man av1 by uva(1 2) uvb(1 2)
  /pri hom(bar) /des.
graph /sca(xyz)=av1 with uva with uvb.
*.
* ANCOVA mehrfaktoriell (Kovarianzanalyse).
ano av1 by uva(1 2) uvb(1 2) with av2
  /sta mca mea /met hie.
graph /sca(xyz)=av1 with av2 with uva.
*.
* Abhängige Messungen, Messwiederholung:
* MANOVA bzw. ANOVA abhängig einfaktoriell.
man av1 av2 av3
 /wsf mwh (3)
 /pri err (cor)
 /des.
*.
* MANOVA bzw. ANOVA abhängig  mehrfaktoriell.
man av1 av2 av3 by uva(1 2)
 /wsf mwh(3)
 /pri hom (box) err (cor)
 /des.
*.
* MANCOVA bzw. ANCOVA abhängig mehrfaktoriell
* (Kovarianzanalyse).
man av1 av2 by uva(1 2) with (av3)
 /wsf mwh(2)
 /pri hom (box) err (cor) /des.
*.
* Friedman ANOVA.
npar test /fri av1 av2 av3.
*.
* Partielle Korrelation.
cor av1 av2 av3 /pri nos.
par cor av2 with av3 by av1
 /for con.
graph /sca(xyz)=av1 with av2 with av3.
*.
```

Ausgabe:

```
  85,93   83,55   76,19
  81,13   81,32   74,06
 100,13   88,51   98,59
  96,92   97,22   92,45
  95,80  114,49  101,20
  84,17   97,60   97,50
 124,82  143,93  132,08
 101,85   98,18   85,68
 106,35  122,92  102,15
 100,92  120,57   99,03
  94,18  108,96   90,61
 114,88  116,17  126,46
  97,81   98,26   95,18
 113,76  122,18   98,14
 118,03  134,43  120,96
 121,76  133,15  124,41
 100,80  119,48   98,19
 112,10  107,78  131,95
 109,58  113,75  111,05
  92,11   96,98   89,41
```

av1	av2	av3	uva	uvb
85,93	83,55	76,19	1	1
81,13	81,32	74,06	1	1
100,13	88,51	98,59	1	1
96,92	97,22	92,45	1	1
95,80	114,49	101,20	1	1
84,17	97,60	97,50	1	2
124,82	143,93	132,08	1	2
101,85	98,18	85,68	1	2
106,35	122,92	102,15	1	2
100,92	120,57	99,03	1	2
94,18	108,96	90,61	2	1
114,88	116,17	126,46	2	1
97,81	98,26	95,18	2	1
113,76	122,18	98,14	2	1
118,03	134,43	120,96	2	1
121,76	133,15	124,41	2	2
100,80	119,48	98,19	2	2
112,10	107,78	131,95	2	2
109,58	113,75	111,05	2	2
92,11	96,98	89,41	2	2



```
                    * * *  C E L L   M E A N S  * * *

              AV1
           by UVA
              UVB

Total Population

   102,65
 (    20)

UVA
        1         2

    97,80    107,50
 (    10)  (    10)

UVB
        1         2

    99,86    105,45
 (    10)  (    10)

          UVB
                 1         2
UVA
        1     91,98    103,62
            (     5)  (     5)

        2    107,73    107,27
            (     5)  (     5)
```

```
          * * *  A N A L Y S I S   O F   V A R I A N C E  * * *

              AV1
           by UVA
              UVB

              HIERARCHICAL sums of squares
              Covariates entered FIRST
```

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	626,538	2	313,269	2,397	,123
UVA	470,353	1	470,353	3,599	,076
UVB	156,185	1	156,185	1,195	,291
2-Way Interactions	183,073	1	183,073	1,401	,254
UVA UVB	183,073	1	183,073	1,401	,254
Explained	809,611	3	269,870	2,065	,145
Residual	2091,256	16	130,703		
Total	2900,866	19	152,677		

20 cases were processed.
0 cases (,0 pct) were missing.

```
* * *  M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S  * * *

              AV1
         by   UVA
              UVB


Grand Mean =   102,65
                                                     Adjusted for
                                        Unadjusted   Independents
Variable + Category              N      Dev'n  Eta   Dev'n   Beta

UVA
    1                           10      -4,85        -4,85
    2                           10       4,85         4,85
                                              ,40            ,40

UVB
    1                           10      -2,79        -2,79
    2                           10       2,79         2,79
                                              ,23            ,23

Multiple R Squared                                        ,216
Multiple R                                                ,465


The default error term in MANOVA has been changed from WITHIN CELLS to
WITHIN+RESIDUAL.  Note that these are the same for all full factorial
designs.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* * * * * * A n a l y s i s   o f   V a r i a n c e * * * * * *


        20 cases accepted.
         0 cases rejected because of out-of-range factor values.
         0 cases rejected because of missing data.
         4 non-empty cells.

         1 design will be processed.

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Univariate Homogeneity of Variance Tests

 Variable .. AV1

     Bartlett-Box F(3;461) =                  ,40624, P =  ,749
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


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* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

 Tests of Significance for AV1 using UNIQUE sums of squares
 Source of Variation          SS      DF        MS         F  Sig of F

 WITHIN CELLS            2091,26      16    130,70
 UVA                      470,35       1    470,35      3,60      ,076
 UVB                      156,18       1    156,18      1,19      ,291
 UVA BY UVB               183,07       1    183,07      1,40      ,254

 (Model)                  809,61       3    269,87      2,06      ,145
 (Total)                 2900,87      19    152,68

 R-Squared =           ,279
 Adjusted R-Squared =  ,144

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```
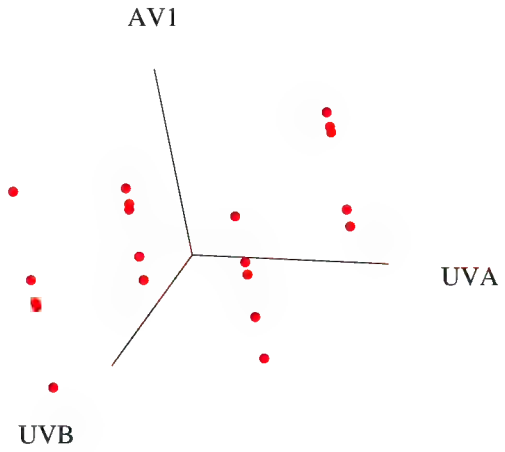

Hi-Res Chart # 2:3d-scatterplot von av1 uva uvb



* * * C E L L M E A N S * * *

AV1
by UVA
UVB

Total Population

102,65
(20)

UVA

1	2
97,80	107,50
(10)	(10)

UVB

1	2
99,86	105,45
(10)	(10)

UVA \ UVB	1	2
1	91,98	103,62
	(5)	(5)
2	107,73	107,27
	(5)	(5)

* * * A N A L Y S I S O F V A R I A N C E * * *

AV1
by UVA
UVB
with AV2

HIERARCHICAL sums of squares
Covariates entered FIRST

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Covariates	2049,043	1	2049,043	39,778	,000
AV2	2049,043	1	2049,043	39,778	,000
Main Effects	69,490	2	34,745	,675	,524
UVA	67,323	1	67,323	1,307	,271
UVB	2,167	1	2,167	,042	,840
2-Way Interactions	9,650	1	9,650	,187	,671
UVA UVB	9,650	1	9,650	,187	,671
Explained	2128,184	4	532,046	10,329	,000
Residual	772,682	15	51,512		
Total	2900,866	19	152,677		

20 cases were processed.
0 cases (,0 pct) were missing.

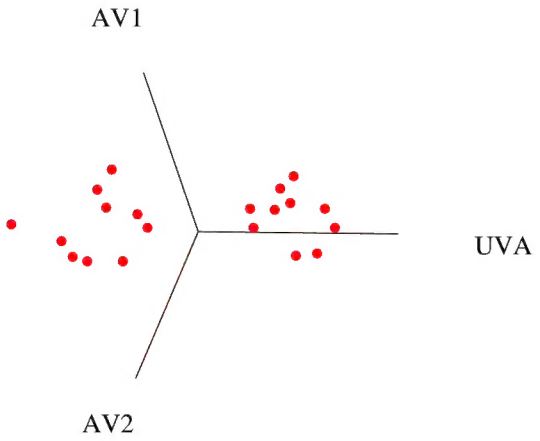
* * * M U L T I P L E C L A S S I F I C A T I O N A N A L Y S I S * * *

AV1
by UVA
UVB
with AV2

Grand Mean = 102,65

Variable + Category	N	Unadjusted Dev'n	Eta	Adjusted for Independents + Covariates Dev'n	Beta
UVA					
1	10	-4,85		-1,89	
2	10	4,85		1,89	
			,40		,16
UVB					
1	10	-2,79		,35	
2	10	2,79		-,35	
			,23		,03
Multiple R Squared					,730
Multiple R					,855

```
Hi-Res Chart  # 3:3d-scatterplot von av1 av2 uva
```




```
The default error term in MANOVA has been changed from WITHIN CELLS to
WITHIN+RESIDUAL.  Note that these are the same for all full factorial
designs.


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* * * * * * A n a l y s i s   o f   V a r i a n c e * * * * * *


        20 cases accepted.
         0 cases rejected because of out-of-range factor values.
         0 cases rejected because of missing data.
         1 non-empty cell.

         1 design will be processed.

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests involving 'MWH' Within-Subject Effect.


 Mauchly sphericity test, W =       ,84825
 Chi-square approx. =           2,96239 with 2 D. F.
 Significance =                    ,227

 Greenhouse-Geisser Epsilon =       ,86825
 Huynh-Feldt Epsilon =              ,94795
 Lower-bound Epsilon =              ,50000

AVERAGED Tests of Significance that follow multivariate tests are equivalent to
univariate or split-plot or mixed-model approach to repeated measures.
Epsilons may be used to adjust d.f. for the AVERAGED results.
```

```
* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests involving 'MWH' Within-Subject Effect.

 AVERAGED Tests of Significance for AV using UNIQUE sums of squares
 Source of Variation          SS      DF        MS         F  Sig of F

 WITHIN CELLS            2022,91      38     53,23
 MWH                      754,20       2    377,10      7,08       ,002

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -




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Note: there are 2 levels for the MWH effect.  Average tests are identical
to the univariate tests of significance.

The default error term in MANOVA has been changed from WITHIN CELLS to
WITHIN+RESIDUAL.  Note that these are the same for all full factorial
designs.


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* * * * * * A n a l y s i s   o f   V a r i a n c e * * * * * *


        20 cases accepted.
         0 cases rejected because of out-of-range factor values.
         0 cases rejected because of missing data.
         2 non-empty cells.

         1 design will be processed.

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
              CELL NUMBER
                1    2
 Variable
   UVA          1    2

 Univariate Homogeneity of Variance Tests

 Variable .. AV1

       Bartlett-Box F(1;972) =                    ,30761, P =  ,579

 Variable .. AV2

       Bartlett-Box F(1;972) =                   1,66833, P =  ,197

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Cell Number .. 1

 Determinant of Covariance matrix of dependent variables =      18816,17517
 LOG(Determinant) =                                              9,84247

 - - - - - - - - - -

 Cell Number .. 2

 Determinant of Covariance matrix of dependent variables =       6318,00862
 LOG(Determinant) =                                              8,75116

 - - - - - - - - - -


 Determinant of pooled Covariance matrix of dependent vars. =     12344,63169
 LOG(Determinant) =                                                9,42098
```

```
 Multivariate test for Homogeneity of Dispersion matrices

 Boxs M =                          2,23489
 F WITH (3;58320) DF =              ,65534, P =    ,580 (Approx.)
 Chi-Square with 3 DF =            1,96588, P =    ,580 (Approx.)

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


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* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests of Between-Subjects Effects.

 Tests of Significance for T1 using UNIQUE sums of squares
 Source of Variation          SS      DF        MS         F  Sig of F

 WITHIN CELLS            2371,89      17    139,52
 REGRESSION              4289,44       1   4289,44     30,74      ,000
 UVA                       17,23       1     17,23       ,12      ,730

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 Standard deviations for dependent variable T1

 Error Term                    Std. Dev.
 WITHIN CELLS                  11,81197

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Regression analysis for WITHIN CELLS error term
 --- Individual Univariate ,9500 confidence intervals
 Dependent variable .. T1

 COVARIATE            B        Beta   Std. Err.     t-Value  Sig. of t

 TAV3            ,67264      ,80989        ,121       5,545       ,000

 COVARIATE   Lower -95%  CL- Upper

 TAV3              ,417        ,929

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


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* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests involving 'MWH' Within-Subject Effect.

 Tests of Significance for T2 using UNIQUE sums of squares
 Source of Variation          SS      DF        MS         F  Sig of F

 WITHIN CELLS            867,55      18     48,20
 MWH                     535,82       1    535,82     11,12      ,004
 UVA BY MWH                ,86       1       ,86       ,02      ,895

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 Standard deviations for dependent variable T2

 Error Term                    Std. Dev.
 WITHIN CELLS                   6,94241

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

```
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- - - - Friedman Two-Way Anova

     Mean Rank   Variable

          1,80   AV1
          2,65   AV2
          1,55   AV3

          Cases        Chi-Square          D.F.   Significance
            20           13,3000             2          ,0013



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                        - - Correlation Coefficients - -

              AV1         AV2         AV3

AV1          1,0000       ,8404**     ,8625**
AV2           ,8404**    1,0000       ,7494**
AV3           ,8625**     ,7494**    1,0000

* - Signif. LE ,05     ** - Signif. LE ,01     (2-tailed)

" , " is printed if a coefficient cannot be computed

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- - - P A R T I A L   C O R R E L A T I O N   C O E F F I C I E N T S - - -

Controlling for..    AV1

                AV3

AV2           ,0893

* - Signif. LE ,05     ** - Signif. LE ,01     (2-tailed)

" , " is printed if a coefficient cannot be computed
```
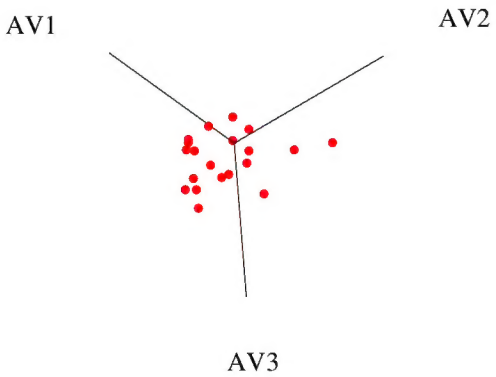
Hi-Res Chart # 4:3d-scatterplot von av1 av2 av3